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SAN ISIDRO WATERSHED

REHABILITATION PLAN

PREPARED MARCH 1985
REVISED JANUARY 1988

RIO PUERCO RESOURCE AREA

ALBUQUERQUE DISTRICT, NEW MEXICO

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Submitted by:

Rangeland/Watershed Specialist

Rio Puerco Range Staff Chief

I concur with this plan:

District 4141 Program Leader
(Ted Schmutzler)

Official Approval of Plan:

(Acting)

Albuquerque District Ranger

Submitted by:

Monitoring/Watershed Specialist 3/16/88

Rio Puerco Range Range Staff Chief

I concur with this plan:

District 4341 Program Leader
(Soil Scientist)

Official Approval of Plan:

Rio Puerco Resource Area Manager
(Acting)

Albuquerque District Manager

INTRODUCTION

The Federal Land Policy and Management Act, The Clean Water Act, and other Federal statues and executive orders direct the Bureau of Land Management to prevent undue degredation of public lands and maintain and improve soil and water conditions on that land. Vegetative cover for watershed protection is dependent upon maintaining the soils inherent productivity. Surface water produced on public land is important for livestock, wildlife, fisheries, recreational, domestic agricultural and industrial usage. These uses are enhanced by the maintenance of good watershed conditions on public land.

Through inventory of watersheds and a priority rating systems, the Rio Puerco Resource Area, Albuquerque District has chosen the San Isidro watershed for sediment control and gully rehabilitation work. Portions of this drainage are actively headcutting and contributing sediment to downstream reservoirs and farmland on the Rio Puerco and Rio Grande.

A special emphasis in the San Isidro watersheds will be on the structural treatment of small continuous gullies. This dictates that most of the structural work will occur on the upper reaches of the watershed.

A. Description of Soil and Water Condition

1. Soils

The following soil mapping units are found in the watershed:

Map Symbol	Mapping Unit	Acres	Percent
17	Vesilla-Menefee-Rock outcrop complex	7,473	59
24	Orlie - Sparham Association	4,230	34
57	Shale Badlands	611	5
146	Sedmar loamy sand	228	2
26	Orlie loam	20	less than 1
	Total	12,562	100

Refer to Appendix 1 Map for location of soils.

(17) Vessilla - Menefee - Rock outcrop complex (59%)

Consist of shallow, light-colored, strongly sloping and moderately steep soils from 3 - 25 percent, located on sandstone mesas and breaks. The surface layer is light brownish gray in color, ranges from fine sandy loam to loamy sand in texture, and contains much lime. This layer has a fine granular structure and a very friable consistence. The subsoil consists of grayish-brown, calcareous fine sandy loam of blocky structure. The underlying material weathered from the underlying sandstone. This material is calcareous and sandy. The depth to sandstone is 6 to 16 inches. Vessilla soils are well drained. Internal drainage is rapid. Permeability is rapid, 2.50 to 7.50 inches per hour. The water holding capacity is low, .18 inches per inch of soil. Reaction ranges from 7.9 to 8.4 PH. Shrink-swell potential is low. Hydrologic soil group ranges from B to D.

(24) Orlie - Sparham Association (34%)

This deep, well drained soil occupies gently sloping 1 - 5 percent, upland side slopes and mesas. Typically, the surface layer is a reddish brown and light reddish brown clay loam and silty clay loam to 60 inches or more. This soil is low in organic matter content and natural fertility. Permeability is 0.2 to 2.0 inches per hour. Available water holding capacity is 0.13 to 0.19 inches per inch of soil. Soil reaction ranges from 7.4 to 9.0 PH. Shrink-swell potential is low to moderate. Hydrologic soil group is B. This means it has a moderate infiltration rate and water transmission rate.

(57) Shale Badlands (5%)

Consist of areas that are steep or very steep and nearly barren on slopes of 20 to 75 percent. Found mainly in the northern portion of the watershed. The surface is dissected by many drainage channels. About 80 to 90 percent of the area is raw shale and sandstone. Mesa escarpments are covered with sandstone fragments. Local variations in relief are as much as 500 feet. Runoff is very rapid and geologic erosion is active. The Hydrologic soil group is D. This means it has a slow infiltration rate with a high swelling potential, high permanent water table, clay layer or clay pan at or near the surface over nearly impervious materials. These soils have a slow rate of water transmission.

(147) Sedmar loamy sand (2%)

This shallow, somewhat excessively drained soil is found on the highest mesa tops and breaks on slopes of 1 to 15 percent. It is formed in residum derived dominantly from sandstone. The surface layer is light yellowish brown loamy sand about 1 inch thick. The upper 4 inches of the underlying material is brownish yellow sandy loam. The lower part to a depth of 18 inches is brownish yellow loamy sand. Sandstone is at a depth of 18 inches. Permeability is rapid. Available water holding capacity is very low. Runoff is slow and the hazard of water erosion is slight. The hazard of soil blowing is severe. The hydrologic soil group is A.

(26) Orlie Loam -

This soil occupies less than 1 percent of the watershed and is not considered significant for this plan.

Estimated weighted average sediment yield by soils within the watershed are as follows (1975):

		Present Estimated Sediment Yield		
Soil Map Unit No.	Square Miles	*Ac.ft./sq.mi/yr.	Ac.ft./yr.	Tons/yr.**
17	11.70	.57	6.67	9,438
24	6.60	1.10	7.26	10,273
57	.95	3.85	3.66	5,179
146	.36	.29	.10	142
		Total	17.69	25,032

*Calculated from BLM Sediment Yield Factor Rating Forms 7310-16
**Assume 1 acre foot = 1415 Tons

2. Water Resources

a. Climate

This watershed lies in the Northern Mountains climatic region of New Mexico. Annual precipitation ranges from 10 to 12 inches. Freeze-free period precipitation is 7 inches. Moisture deficit is 10 inches. Maximum and minimum precipitation during the growing season is 10 and 4 inches respectively.

Scattered thunderstorm activity with short duration, high intensity rainfall can be expected during the summer (July, Aug. and Sept.) beginning in the late afternoon. During some winters snow accumulation can be expected, especially on the western facing slopes.

b. Surface waters

The San Isidro Wash is a major tributary of the Arroyo Chico, lying in the Rio Puerco basin above Rio San Jose and lies in the larger Rio Grande basin. The drainage area is approximately 12,562 acres or 19.6 sections. Mean discharge is about 1.0 cubic foot per second. The ephemeral stream flows vary considerably from one year to the next. Streamflow on the main drainages is primarily the result of intense rainfall. On the average, August is the heaviest runoff month.

Estimates of peak runoff from watersheds one square mile in size from the two major soils in the watershed are as follows:

	*CFS/Square Mile		
Soil	6 hour 2 yr. storm	6 hour 10 yr. storm	6 hour 50 yr. storm
(17) Vessilla-Menefee-Rock outcrop complex	100	200	350
(24) Orlie-Sparham	90	160	240

Runoff from shale badlands is approximately 95-100 percent of precipitation.
*Cubic feet per second

The surface water quality of runoff from the area is generally poor. The main channels and their tributaries are deeply incised and generally in very poor condition. The main valley of San Isidro is in an erosion cycle that was apparently initiated in the 1870's, coinciding with the large number of livestock grazing the area and then later in the late 1800's and early 1900's when many of the larger channels dramatically deepened then widened. Active channel erosion continues to the present time. In the main drainages channels have cut down to bedrock, or to a point where down cutting and resistive forces are offsetting. Presently the main channels are widening. Many of the smaller tributary channels are in a more youthful state of development. Channel downcutting is still occurring and headcuts are common.

2. Water Resources

a. Climate

This watershed lies in the Northern Mountains climatic region of New Mexico. Annual precipitation ranges from 10 to 12 inches. Freeze-free period precipitation is 7 inches. Moisture deficit is 10 inches. Maximum and minimum precipitation during the growing season is 10 and 4 inches respectively.

Scattered thunderstorm activity with short duration, high intensity rainfall can be expected during the summer (July, Aug. and Sept.) beginning in the late afternoon. During some winters snow accumulation can be expected, especially on the western facing slopes.

b. Surface waters

The San Isidro Wash is a major tributary of the Arroyo Chico, lying in the Rio Puerco basin above Rio San Jose and lies in the larger Rio Grande basin. The drainage area is approximately 13,502 acres or 19.8 sections. Mean discharge is about 1.0 cubic foot per second. The ephemeral streams flows vary considerably from one year to the next. Streamflow on the main drainages is primarily the result of intense rainfall. On the average, August is the heaviest runoff month.

Estimates of peak runoff from watersheds one square mile in size from the two major soils in the watershed are as follows:

Soil	5 yr. storm	10 yr. storm	50 yr. storm	6 hour	6 hour
(17) Vessilla-Bhandlee-Rock outcrop complex	100		200		350
(26) Uvile-Spartan	90		160		240

*Cubic feet per second

Runoff from study badlands is approximately 95-100 percent of precipitation.

The surface water quality of runoff from the area is generally poor. The main channels and their tributaries are deeply incised and generally in very poor condition. The main valley of San Isidro is in an erosion cycle that was apparently initiated in the 1870's, coinciding with the large number of livestock grazing the area and then later in the late 1800's and early 1900's when many of the larger channels dramatically deepened then widened. Active channel erosion continues to the present time. In the main drainage channels have cut down to bedrock, or to a point where down cutting and coalative forces are offsetting. Presently the main channels are widening. Many of the smaller tributary channels are in a more youthful state of development. Channel downcutting in arroyo cutting and headcuts are common.

c. Ground waters

The quantity of ground water available within the watershed is unknown. Most of the bedrock aquifers usually yield small to moderate quantities of water. Locally heavy yields are possible in certain locations. The alluvial deposits in the drainage bottoms and the main San Isidro Valley bottom provide a source of ground water with variable quality.

Most of the alluvial aquifers in the watershed are fed by local precipitation and runoff. Bedrock aquifers are recharged by precipitation wherever they outcrop. In some cases, these locations are outside the watershed boundary. Stream flow helps recharge bedrock aquifers where they outcrop in channels. Conditions over much of the watershed are not conducive to ground water recharge. Lack of ground cover tends to decrease infiltration and percolation and promotes rapid surface runoff.

The watershed is part of a designated ground water basin. This means that ground water cannot be developed and put to beneficial use without a permit from the State Engineer.

Water quality in the watershed varies widely. Not only does chemical quality differ from one stratographic unit to another, it also differs within the same unit. Waters are generally high in sodium, relative to calcium, magnesium and sulfate. Most of the waters are undesirable for domestic use due to high concentrations of sulfates and other dissolved solids. However, the concentrations are not high enough to classify most waters as impotable. Nearly all the water is acceptable for livestock use.

B. Problem Analysis

Summer storm events occur characterized by high intensity rainfall for short periods on the upper portions of the watershed. Almost all this rainfall runs off the steep slopes of the shale badlands (57) and the rock outcrop portions and steeper slopes of the Vessilla-Menefee-Rock outcrop complex (17). This runoff is channeled downward and flows through the alluvial bottom areas of the Orlie-Sparham Association (24) soil. The high peak flows act with a flushing action on the channels in these areas. The gullies that are already continuous are cut deeper and wider. The discontinuous gullies advance headcutting upstream and build alluvial fans downstream.

The changes in sediment yield could be altered by the proposed action in soil (24) with a present estimated yield of 1.10 Ac. ft./sq. mile/yr. This is where the structures would be built. There would be very little change in soil (57) because the erosion occurring there is primarily geologic. Soil (17) is located primarily on steep slopes, breaks and mesas where channel erosion control structures are not feasable.

The ground cover on soil (24) is too sparce to hold the soil in place. In some areas bare ground ~~easily~~ exceeds 50 percent. Grazing management alone has not slowed down or prevented gully erosion on this watershed. Vegetative and litter cover have improved with varied success, however, gully ersion still continues to be a problem. Ground cover will not increase substantially on some soils in the watershed becouse of low infiltration rates.

The gully erosion in the valley bottoms where livestock concentrate have caused tap-rooted plants such as big sagebrush to replace the shallow rooted grasses in many areas. This is due in part to the lowering of the water table by the gully.

C. Current Resource Management and Existing Data Base

The Rio Puerco RMP references the need for watershed activity plans in Chapter 2 page 7. The priority for treatment of the San Isidro watershed is based on the last watershed inventories in 1973 and 1975. Portions of four grazing allotments located within the watershed all have allotment management plans. These AMP's have grazing prescriptions that vary in intensity. This grazing management has been in place since the early 1970's. None of the existing AMP's considered water structural measures to control erosion, only grazing rest during certain periods.

D. Public Interest

Domestic use of water in the watershed is slight. There is one ranch that has full time residents living in the watershed, about four people total. During the weekends another four ranchers use the area.

Drinking water for domestic livestock and wildlife are other important uses in the watershed. The location of available water heavily influences the distribution of livestock and wildlife. There are four springs, two wells, and 24 detention and retention dams located within the watershed.

Ephemeral flows from the watershed runoff contribute to the Rio Grande. Most of this water is utilized by downstream appropriators for irrigation, or helps meet the water required by the Rio Grande Pact with Texas and by international treaty with Mexico.

Portions of four grazing allotments have the following estimated numbers grazing in the watershed:

Allotment No. and Name	No. of Cattle	Mule Deer
4 - Starr	14	3
5 - Dry Spring	68	6
6 - Tres Hermanos	34	3
8 - Ojo de los Pinos	90	7
Total	206	19

The estimated total consumptive water needs are 3,090 gallons per day for 206 cattle and 11 gallons per day for 19 mule deer.

The ground cover on soil (3A) is too sparse to hold the soil in place. In some areas here ground cover exceeds 30 percent. Grazing management alone has not slowed down or prevented gully erosion on this watershed. Vegetative and litter cover have improved with varied success, however, gully erosion still continues to be a problem. Ground cover will not increase substantially on some soils in the watershed because of low infiltration rates.

The gully erosion in the valley bottoms where livestock concentrate have caused trap-rooted plants such as big sagebrush to replace the shallow rooted grasses in many areas. This is due in part to the lowering of the water table by the gully.

c. Current Resource Management and Existing Data Base

The Rio Puerco SMP references the need for watershed activity plans in Chapter 2 page 7. The priority for treatment of the San Isidro watershed is based on the last watershed inventories in 1973 and 1975. Portions of four grazing allotments located within the watershed all have allotment management plans. These ANP's have grazing prescription that vary in intensity. This grazing management has been in place since the early 1970's. None of the existing ANP's considered water structural measures to control erosion, only grazing rest during certain periods.

b. Public Interest

Domestic use of water in the watershed is slight. There is one ranch that has full time residents living in the watershed, about four people total. During the weekends another four ranchers use the area.

Providing water for domestic livestock and wildlife are other important uses in the watershed. The location of available water heavily influences the distribution of livestock and wildlife. There are four springs, two wells, and 2½ detention and retention dams located within the watershed.

Ephemeral flows from the watershed runoff contribute to the Rio Grande. Most of this water is utilized by downstream appropriators for irrigation, or helps meet the water required by the Rio Grande Pact with Texas and by international treaty with Mexico.

Portions of four grazing allotments have the following estimated numbers grazing in the watershed:

Allotment No. and Name	No. of Cattle	Mule Deer
4 - Starr	16	3
5 - Dry Spring	68	6
8 - Tres Hermanos	34	3
8 - Ojo de los Pinos	30	7
Total	108	19

The estimated total consumptive water needs are 3,080 gallons per day for 108 cattle and 11 gallons per day for 19 mule deer.

The BLM have recently maintained several large detention dams in the watershed (1987). The useful life of a reservoir in this area is shortened because of the high rate of runoff and sediment yield. Road maintenance within this watershed is above average for cost of comparable roads, because of the number of arroyo crossings that wash out. Most fences that cross drainages must be repaired annually also.

There has been an increase in oil and gas well drilling in the watershed by the Gary-Williams Oil Co. They could become a major consumer of ground water in the future.

Many oil and gas exploration and well maintenance roads throughout the watershed have been poorly developed. The oil and gas exploration companies have disturbed the soils and vegetative cover by blading a road to each drilling location or well. Most of these roads are 20 feet wide or more.

E. Objectives

General

Reduce the sheet and gully erosion occurring on the watershed through a combination of grazing management (four different AMP's) and small water control structures (Watershed Rehab. Plan).

Specific

1. Reduce the peak flow rates principally in segments 3 and 5 of the watershed.

2. Reduce sediment yield and transport from channels on the Orlie-Sparham Association soils principally in segments 1, 3 and 5 of the watershed. It is estimated that sediment from channel erosion will be reduced by 22 percent after six years and 40 percent after 12 years.

3. Decrease bare ground in the Orlie-Sparham Association from 50 percent or more to 35 perent over the entire watershed (all five segments).

4. Maintain existing retention and detention dams in the watershed that have silted full or have structural damage to spillways, dams or outlet pipes.

5. To raise the water table in alluvial valleys, which would improve or restore riparian vegetation.

F. Constraints

A special emphasis in the San Isidro watershed rehabilitation plan will be on the structural treatment of small continuous and discontimuous gullies, and forks of main drainages. We want to keep silt out of existing large structures already constructed and generally stabilize the channels. Generally we can no longer afford to build the large detention dams that were constructed in the 1950's and 1960's. This dictates that most of the structural work will occur on the upper reaches of the watershed (approximately 21% of the total watershed).

The implementation of this plan can be very flexible depending on the current years economic situation. One or two small drainages or segments in the watershed could be treated each year with the construction of small structures. This should enable us to slowly accomplish a little each year of on-the-ground visual accomplishments to stabilize the watershed.

The control of gullies is an important step in watershed rehabilitation. Gully control designed to fix valley bottoms at a certain base level stabilizes the valley floor through sediment deposition in downstream river beds and improves the quality of water supplies. Benefits of a gully control program accrue to both on-site and downstream users alike.

Volunteers could also be utilized for construction, because much of the work has to be done with hand labor.

G. Planned Actions

1. Check Dams

The chief purpose of check dams in gullies, from the standpoint of erosion control, is to decrease the velocity of the water moving down the gully. By decreasing the velocity, silt and debris are deposited in the gully instead of additional material being eroded away.

The velocity of water is decreased by lessening the effective gradient (i.e., the slope of the channel down which the water flows). When the dam is first built, the flow of water is impeded or slowed immediately upstream. This causes suspended material to be deposited in the catch basin behind the dam.

When the catch basin is filled, a relatively level surface or delta is formed over which the water flows at a non-eroding gradient. The water then cascades over the dam onto a defended area or apron. By constructing a series of such check dams along the gully, a stream channel of comparatively steep slope or gradient is replaced by a "stair-stepped" channel consisting of a succession of gentle slopes with "cushioned" cascades in between.

The proposed action will use a porous type dam. Porous dams release part of the flow through the structure, and thereby decrease the head of flow over the spillway and the dynamic and hydrostatic forces against the dam. Porous dams are simpler and more economical to construct. Natural, indigenous materials such as rock, and posts will be used in lieu of concrete. For most gully work where large torrents are not a factor and where life and high-cost property are not endangered, these simpler porous dams are appropriate.

The spacing, height, and dam configuration are important design considerations regardless of what type of structure is built. In general, numerous low dams along a gully are preferred to a few high dams. A low check dam is considered to be one not over four feet in

height. There is less danger of such structures washing out in time of flood, and if they should wash out, less damage will result. Furthermore, low dams are less expensive than higher ones, because volunteers can be used for the hand labor.

Check dams have different cross sections and can be constructed from different material, but all should have a spillway and apron. The spillway is simply a provision to pass flood flows safely over the dam. This may require a low center or notch, which draws the overflow toward the middle of the channel.

2. Gabion type Drop Structures

These are hydraulic structures which provide a verticle drop of water at the face of a headcut. Water overflows through a weir section over the structure onto an apron below.

Drop structures will stabilize the channel and the channel erosion caused by headcutting will be halted. The slope of the bank of the arroyo will return to its natural state as forbs and grasses grow up through the different layers of rock used to fill gabions. This natural growth will help hold the soil in place and will eventually camouflage the presence of gabions.

Because of their flexibility, structures built of gabions can adapt themselves, without loss of efficiency, to changing stream bed conditions. Where rigid structures may be undermined and collapse, these flexible structures merely shift to conform to the new contour. The same flexibility permits them to yield sufficiently to absorb impacts which might be expected to breach the seemingly lightly fastened structure.

Because they are filled with small rocks these structures are highly permeable. The porous nature of the gabion permits water to flow through, thereby reducing pressure against them, and when used for weirs, reduces the necessary size of the spillway opening.

Although gabion structures are usually built without footings or foundations, they have great stability. This is achieved by wiring the gabions together at the edges so that the units from a single mass which has great weight without sacrificing flexibility.

Other advantages of gabions are ease of repair, replacement, and alteration. Some of these structures are reported to have stood nearly a century with no signs of serious deterioration.

3. Diversion Dikes

These structures are long, low embankments which will direct and control the flow of water along or around larger gullies. These would be used where the head-cut is too wide for a small drop structure and will be used in conjunction with a drop structure for a spillway. The dikes would act as wings for the drop structure. They

will direct water from both sides of the valley bottom toward the drop structure spillway at the center of the channel.

4. Benefit/Cost Analysis

Discount Rate: 8.625

Cost of Proposed Action

38 gabion drop structures	$8,094.
79 check dams	5,925.
Total	$14,019.

Benefits of the Proposed Action

Sediment

10,273 Tons/Year of sediment is being lost at present (1988)
Benefit of on-site sediment yield reduction = $3.00/Ton
The proposed action will retain on site:
22% or 2,260 Tons or 188 Tons/year will be retained after 3 years
40% or 4,109 Tons or 228 Tons/year will be retained after 12 years on up to 18 years where it will be slight or unmeasurable from that point on.

Total Benefits from sediment storage capacity of proposed action $4,852 (SAGERAM)

Vegetative Production and Animal Unit Months (AUM's)

The present vegetative production on the Orlie-Sparham soil association, Clayey Upland Range Site is 600 pounds/acre of air dry forage or 2,472 AUM's.

The benefit of an AUM = $5.98

Total benefits of increased livestock AUM'S $4,582 (SAGEGRAM)

Total Costs of proposed action = $8,434 (SAGEGRAM)

Total Benefits of proposed action = $9,704 (SAGEGRAM)

Ratio of benefit to costs = 1.2/1 (SAGERAM)

There should be little or no maintenance costs associated with this project if gabions and dams are properly constructed. A 50 year project life is projected.

Refer to SAGERAM Analysis printouts in Appendix

File Code 4323.1

CHECKLIST FOR ENVIRONMENTAL ASSESSMENT

EA Log No. NM-017-88-20

Lease or Serial No. _____

Project San Isidro Watershed Rehabilitation Plan

Applicant BLM - Range Staff

Project Location T 21N., R 3W., NMPM

Address 435 Montano NE

County Sandoval

BLM Office Albuquerque - Rio Puerco

Phone No. (505) 761-4504

The following mandatory items have been considered for this environmental assessment. Items that may be impacted have been discussed within the environmental assessment. the remainder will not be affected and are not discussed.

Proposed Action Construct 7 diversion dikes, 79 check dams and 31 head-cut drop structures (gabion type).

	Will Be Impacted yes	Will Be Impacted no	Can Be Mitigated yes	Can Be Mitigated no		Specialist Signature/Date
1.	( )	(X)	( )	( )	Threatened or Endangered Plants	[illegible] 2/23/88
	( )	(X)	( )	( )	Threatened or Endangered Animals	[illegible] 2/23/88
2.	(X)	( )	(X)	( )	Floodplains and Wetlands	D.V. 1/29/88
3.	( )	(X)	( )	( )	Wilderness Values	KW. 2/22/88
4.	( )	(X)	( )	( )	Areas of Critical Environmental Concern	D. Armstrong 2/26/88
5.	( )	( )	( )	( )	Hazardous or Solid Wastes	[illegible] 2/23/88
6.	(X)	( )	(X)	( )	Water Resources-Drinking/Ground/Quality	D.V. 1/29/88
7.	(X)	( )	(X)	( )	Air Quality	D.V. 1/29/88
8.	( )	( )	( )	( )	Cultural or Historic Resources	[illegible] 2/25/88
9.	( )	( )	( )	( )	Paleontological Resources	[illegible] 2/25/88
10.	( )	(X)	( )	( )	Prime or Unique Farmlands	D.V. 1/29/88
11.	( )	(X)	( )	( )	Wild and Scenic Rivers	D Armstrong 2/26/88

→ PENDING CULTURAL RESOURCE INVENTORY - SUBMIT INVENTORY REQUEST

The above project has been analyzed for conformance with BLM plans. Significant discrepancies are discussed in the body of the environmental assessment.

BLM Plan and Date: Rio Puerco RMP, San Isidro Watershed Rehabilitation Plan, March 1985

In addition to the above mandatory items, the following specialists have been consulted for review of this EA.

	Will Be Impacted yes	Will Be Impacted no	Can Be Mitigated yes	Can Be Mitigated no		Specialist Signature/Date
1.	( )	(X)	( )	( )	Lands	[illegible] 2/25/88
2.	( )	(✓)	( )	( )	Minerals	[illegible] 3/25/88
3.	( )	(X)	( )	( )	Wildlife	Beverly Hermann 3/26/88
4.	( )	(X)	( )	( )	Recreation	KW. 2/22/88
5.	(X)	( )	(X)	( )	Range	D.V. 1/29/88
6.	( )	(✓)	( )	( )	Forestry	[illegible] 2/23/88

H.

ENVIRONMENTAL ASSESSMENT
COVER SHEET

EA No.: NM-017-88-20 ( ) Draft EA (X) Final EA

Project: San Isidro Watershed Rehabilitation Plan

Applicant: BLM - Range Staff Project Location: T 2N, R 3W, NMPM

Address: 435 Montano NE, Albuquerque, NM County: Sandoval

BLM Office: Albuquerque, Rio Puerco Phone No.: (505) 761-4585

List of Preparers:

NAME	TITLE	RESOURCE ASSIGNED
Dwain W. Vincent	Monitoring/Watershed Spec	Soil, Water Vegetation
Beverly deGruyter	Wildlife Biologist	Environmental Review
DAVID C. SIMMS ~~Tony Lutonsky~~	Archaeologist	Cultural Resources

Dwain W. Vincent 1-29-88
Team Leader Date

Gene Tatums 3/4/88
Staff Supervisor Date

Area Manager Date 3/14/88

→ As noted, a cultural resource inventory will be done prior to each rehab action.

File Code 4323.1

FINDING OF NO SIGNIFICANT IMPACT AND RECORD OF DECISION

EA Log No. NM-017-88-20

Lease or Serial No.

Project San Isidro Watershed Rehabilitation Plan

Applicant BLM - Range Staff

Project Location T 21N., R 3W., NMPM

Address 435 Montano NE

County Sandoval

BLM Office Albuquerque - Rio Puerco

Phone No. (505) 761-4504

FINDING OF NO SIGNIFICANT IMPACT

Based on the analysis of potential environmental impacts contained in the accompanying environmental assessment, referenced below, I have determined that impacts are not expected to be significant. Therefore an environmental impact statement is not required.

RECORD OF DECISION

Decision: The following is the decision of the Bureau.

ve decided to proceed with the action as described in the proposed action section of the accompanying EA.

Rational:

Watershed stabilization is needed in this watershed to help stop gully erosion, reduce sediment loss, reduce peak flow runoff rates, improve water quality downstream and raise water tables.

Environmental Considerations: I have considered the environmental consequences of this decision as documented in the accompanying environmental assessment. Except as noted in the Rational, all environmental considerations have been adequately addressed in the accompanying document.

STIPULATIONS

This decision incorporates by reference the attached stipulations. The stipulations have been developed to mitigate adverse environmental impacts which may result from the action permitted by this decision.

Reviewed by Jon Tatum
Staff Supervisor

3/14/88
Date

oved by:
Area Manager

3/14/88
Date

BLM REPORT NO. 88(IV)A
JOB CODE 4341-10

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AUG 10 1988

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
NEW MEXICO STATE OFFICE

RECORD OF REVIEW-CULTURAL RESOURCE REPORT COVER SHEET

1. Description of Report:

Date of Inventory 7/21/88 Institution BLM - Rio Puerco RA

Date of Report 8/1/88 Institution Ref. # 88 (IV)A

Date Received by BLM 8/1/88 Antiquities Permit # _____

Author David C. Simons Project Sponsor _____

Undertaking (list each action with T, R, Section: Map; report recommendations, etc.)

Three erosion control structures near Mesa Chijuilla
T 21N., R 3W., Sections 24, 25
Area of impact - 10' X 25' (each structure)
No cultural resources located
Cultural resource clearance recommended

Report Summary:	BLM Land	Other
Acres Inventoried	.17	
Sites Recorded		
Sites Avoided		

BLM Report No. 88(IV)A

2 Results of Review: Reviewer: Anthony F. Lutonsky

Field Check Results: _____

_____

_____

_____

_____

_____

_____ Date: _____

Date Accepted by BLM _____

Date Not Accepted by BLM _____ Date Revisions Accepted by BLM _____

Date Recommendations Changed by BLM _____

3. Consultations with the State Historic Preservation Officer

Date Negative Report Mailed _____ Date Acknowledgement Received _____
Date Avoidance Report Mailed _____ Date Acknowledgement Received _____
Date Request for Determination of Effect Sent _____ Date of Response Received _____
Date Request for Determination of Eligibility Sent _____ Date Response Received _____

SHPO Comments: _____

_____

_____

4. Action Summary (STIPULATIONS FOR EACH ACTION ARE ATTACHED):

PROCEED with action, final clearance granted ____N/A____

WITHHOLD action until:
applicant responds to recommendations _____
applicant responds to requested changes _____
non-Federal lands are surveyed _____
SHPO comments are received _____

5. A. Lutonsky Date 8/2/88
Archaeologist

K. E. Hanson Date 8/3/88
Area Manager

6. _____ Date _____
State Historic Preservation Officer

Encl. 1-2

File Code 4323.1

STIPULATIONS

EA Log No. NM-017-88-20 Lease or Serial No. _____

Project San Isidro Watershed Rehabilitation Plan

Applicant BLM - Range Staff Project Location T 21N., R 3W., NMPM

Address 435 Montano NE County Sandoval

BLM Office Albuquerque - Rio Puerco Phone No. (505) 761-4504

The following stipulations have been developed to mitigate adverse environmental impacts which may result from the action permitted by the accompanying decision. The action permitted and its anticipated impacts are fully described in the environmental assessment or categorical exclusion referenced above.

1. Disturbed areas, dikes and dams in construction areas will be reseeded with alkali sacaton and western wheat grass. This seed will be broadcasted at the rate of 17 pounds per acre for western wheat and 1 pound per acre for alkali sacaton.

2. If cultural resources or artifacts are discovered when excavation begins, all work will cease and the BLM archaeologist will be notified.

3. Off-road use by construction vehicles will be held to a minimum. Existing primitive roads will be used when possible. No new roads will be constructed.

4. Construction will cease when recent precipitation events cause muddy conditions and access roads become "muddy".

H. SAN ISIDRO WATERSHED REHABILITATION PLAN ENVIRONMENTAL ASSESSMENT

INTRODUCTION

The primary purpose of the proposed action is to reduce erosion and sediment caused principally by rainfall runoff flows. High intensity, short duration summer thundershowers cause channel cutting (both deepening and widening) and head-cutting of channels that move continously upstream. This process is caused by the sparse vegetative cover, the type of storms the area receives, and to some extent the type of saline or gyqsum influenced soils found there. The Rio Puerco RMP (1986) references Watershed Activity Plans, Chapter 2 page 7.

PROPOSED ACTION AND ALTERNATIVES

Proposed Action

The proposed action is to construct seven (7) small diversion dikes with drop structure spillways, approximately seventy-nine (79) small check dams, and thirty-one (31) gabion type head-cut drop structures. These structures will be designed to withstand the runoff from a 10 year/6 hour storm. Structures would be constructed of steel posts, woven galvanized wire, ready made wire baskets, filter cloth, cobble rock 6-10 inches is diameter and local soil. A bulldozer would be used on the small dikes and a backhoe plus hand labor will be used for a drop structure or check dam construction. The structures would require periodic maintenance depending on the size, intensity and frequency of storms. A cultural and historic resource inventory will be conducted prior to project construction. No cultural resources will be disturbed. See Appendix 2 for project drawings.

No Action Alternative

This alternative would mean that no runoff or sediment control structures would be built to stabilize the upper portion of the watershed. In addition degradation of the watershed would continue to supply sediment downstream. This will impact the channel of the Rio Grande and its irrigation and flood control systems.

AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

Regional Setting

The area lies approximately ten miles west of Cuba, New Mexico in Sandoval County. It occupies portions of T. 21N. and portions of R. 3W. (refer to location map in Appendix 1). At the nothern most portion, the head of the watershed is the Continental Divide. The area is bounded on the west by Mesa Penistaja and on the east by Mesa Chijuilla. The upper portion of the watershed where the stabilization would occur is 12,562 acres in size. The elevation ranges from 7,554 to 6,860 feet.

Natural Environment

Soil

Almost all the proposed structures would be constructed in the Orlie-Sparham soil association. The Orlie soils are on the side slopes of the drainages and the Sparham soils are on the valley bottoms. The Orlie soil is a yellowish brown fine sandy loam about 2 inches thick, underlain by a brown clay loam about 23 inches thick. Permeability of the Orlie is moderately clow. Available water holding capacity is high. Runoff is medium, and the hazard of water erosion is moderate. The Sparham soil is a brown clay about 3 inches thick underlain by a dark brown clay about 3 inches thick underlain by a dark brown calcarous clay. Permeability is slow. Available water capacity is high. Runoff is slow and the hazard of water erosion is moderate. Gully erosion is common.

Under the proposed action, soils will be distrubed and excavated by equipment near each dam, dike or head-cut structure. Contruction sites will tempoarily expose bare soil to erosion by wind and water, until sites are revegetated. With the proposed action, sediment yield on the Orlie-Sparham soils would be reduced from the present 10,273 tons per acre feet per year to 8,013 tons after 12 years and 3,904 tons after 18 years. The decreases in sediment yield would occur due to the healing of head-cuts and stabilization of streambanks.

Under the no action alternative, the head-cuts would continue to advance upstream resulting in further loss of sediment. Small gullies would continue to cut deeper and wider adding to the sediment load.

Water

San Isidro Wash runs approximately 5 1/2 miles southwest from its source at the Continental Divide to a point downstream where it opens up into the San Isidro Valley. The San Isidro Wash is a major tributary of the Arroyo Chico, lying in the Rio Puerco basin above Rio San Jose. Mean discharge is about 1.0 cubic foot per second. The ephemeral stream flows vary considerably from one year to the next. Annual precipitation ranges from 10-12 inches.

Peak flows that cause channel erosion will be reduced significantly by the proposed action. The water table should rise as channels heal with increased vegetative ground cover. Water quality would improve downstreams.

Under the no action alternative, high peak flows will continue to occur in August and September, flushing the channels. The water table would also continue to be lowered.

Channel or Gully Erosion

There are approximately 31 gulley head-cuts that have been identified in the watershed that are actively cutting. There are approximately 7 small channels where a series of check dams would stabilize the channel, reduce peak flows and reduce sediment downstream. There are approximately 7 large head-cuts where a diversion dike constructed above them would effectively solve the erosion problem.

The gully headcutting in the San Isidro Watershed will be directly controlled and the gully extensions toward their headwaters will be stopped if the proposed action is approved. Maximum erosion control and minimum costs can be obtained if these critical head-cut locations are treated first. Constructing the check dams is the second most important step in the rehabilitation of the San Isidro watershed. Gully control designed to fix valley bottoms at a certain base level stabilizes the valley floor through sediment accumulation in the gully channel. This reduces sediment deposition in downstream river beds and improves the quality of water supplies. Benefits of the proposed gully control program accrue to both on-site and downstream users alike.

Under the no action alternative no benefits would accrue from control of channel or gully erosion.

Vegetation

The area of the watershed where erosion control structures identified in the proposed action would be constructed is a grassland-shrub plant community characterized by alkali sacaton, western wheatgrass, big sagebrush and rabbitbrush. Ground cover averages 30% vegetation, 20% litter and 50% bare ground. Herbage production is approximately 600-800 pounds per acre (air dry) depending on growing season precipitation. There are no known populations of endangered or threatened flora in the watershed.

Vegetation will be destroyed during construction on small areas near each drop structure, check dam or dike. A total of approximately 9,009 square feet or .2 acres of vegetation would be destroyed by the proposed action. After completion of the proposed structures sediment accumulation and vegetative growth should occur in the channel bottoms, thereby stabilizing the channels

Under the no action alternative, vegetation will continue to be lost as channels cut back, widen and deepen. Undesirable shrubs may become dominant along the valley bottoms, because they can out-compete the shallow rooted grasses. The tap roots of shrubby species can reach down into the receeding water table. Less overall vegetative cover will allow flows to increase their erosive power.

HUMAN CREATED ENVIRONMENT

Cultural Resources

Some Indian relics and old homesteads are found in the area, but have not been inventoried or interpreted. Refer to stipulation 2, if cultural resources are uncovered during excavation.

CONSULTATION AND PUBLIC INPUT

Agencies and Individuals Consulted

Proponent of Action - Rio Puerco Range Staff

Public Input

Joel Taylor - Permittee
Dickie Archuleta - Permittee

References

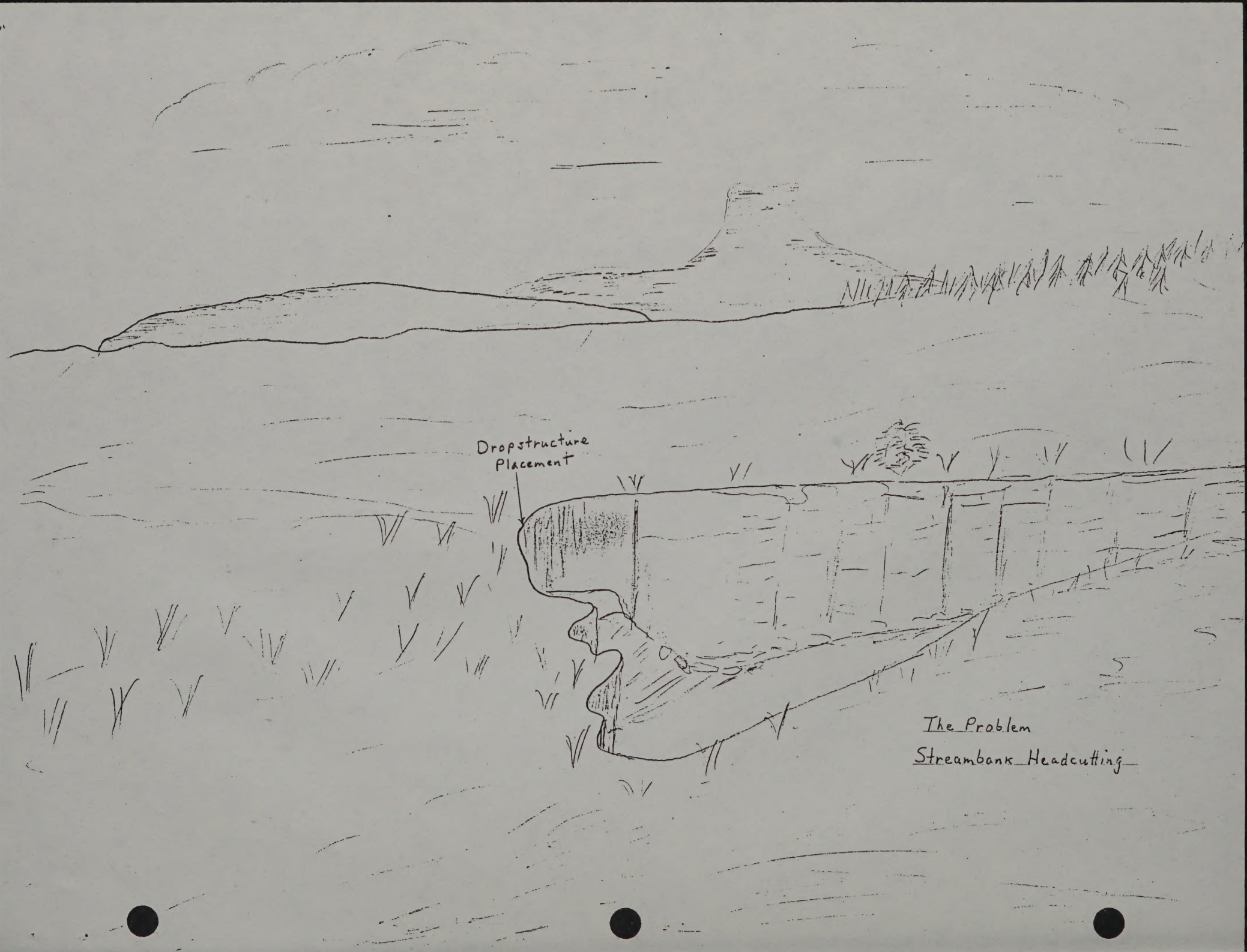
See Reference section of San Isidro Water Rehabilitation Plan, March, 1985

Appendices -

Topographic Location map - Appendix 1
Drawings - Appendix 2

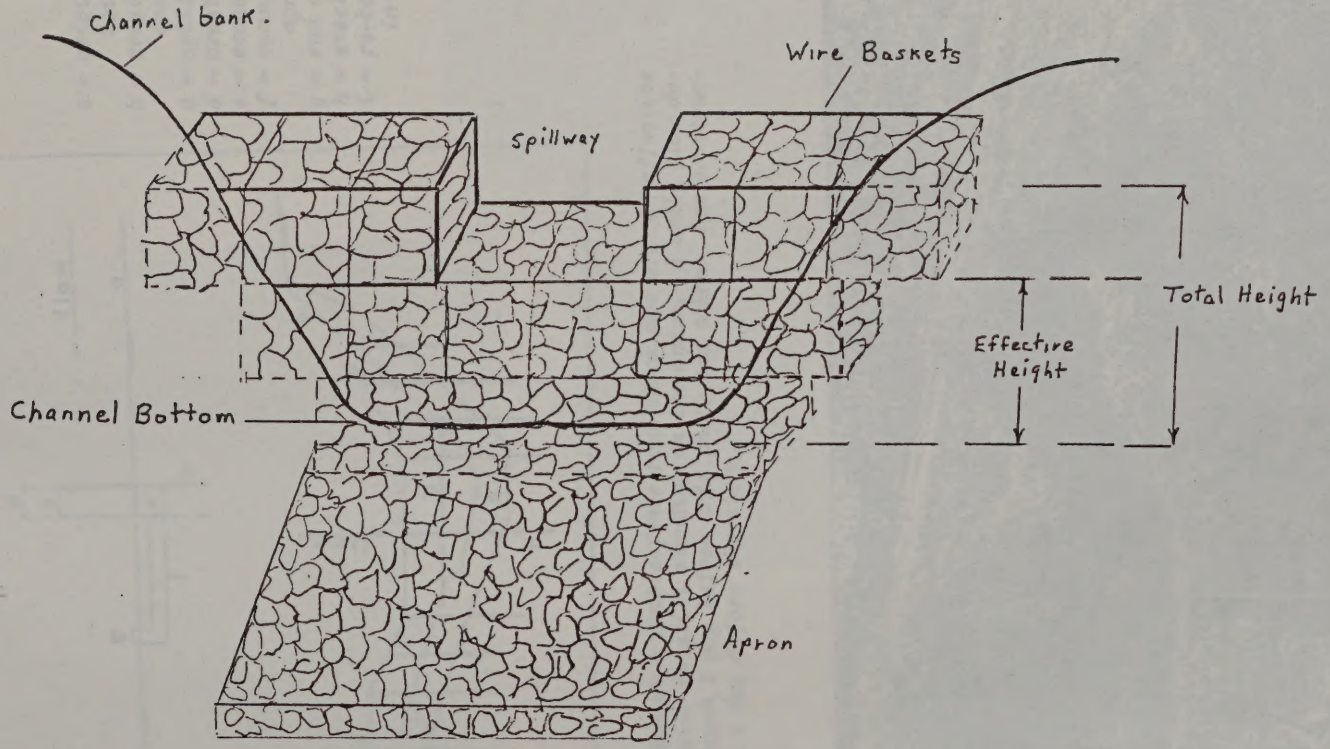
I. Project Design

The following sketches, photographs and drawings will serve as examples of the proposed action. Design of the individual check dam, drop structure or dike will be based on site characteristics.



The Problem

Streambank Headcutting



The Solution

Gabion Dropstructure

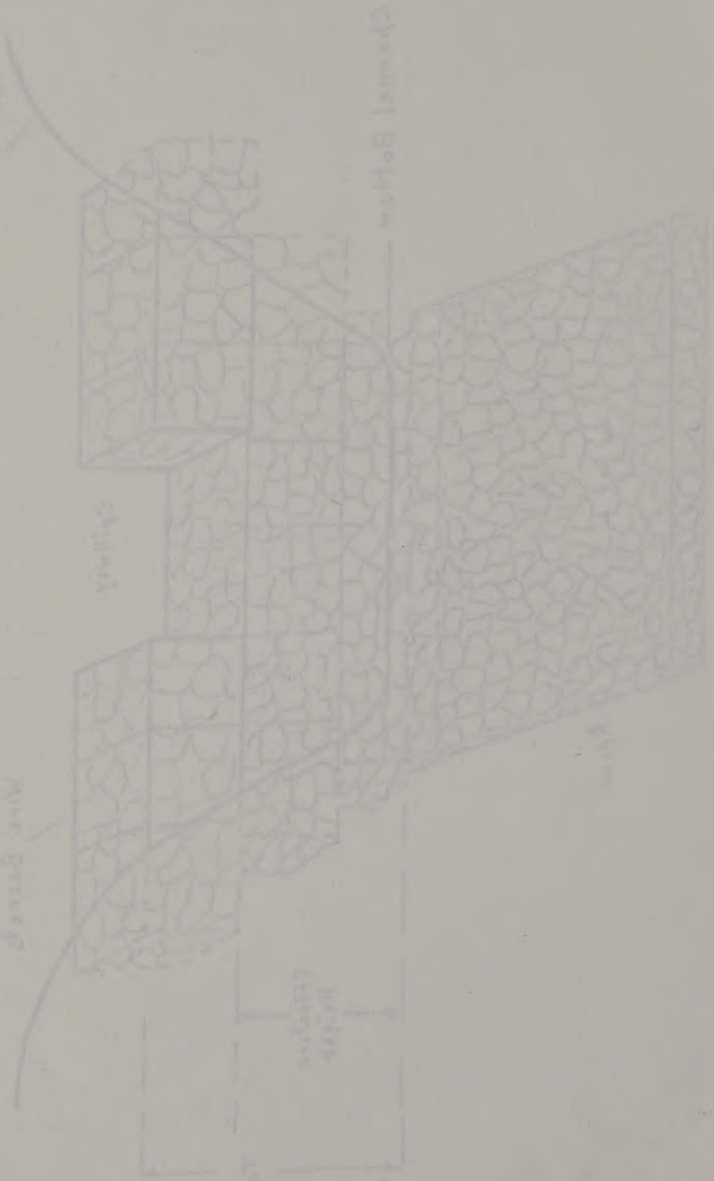
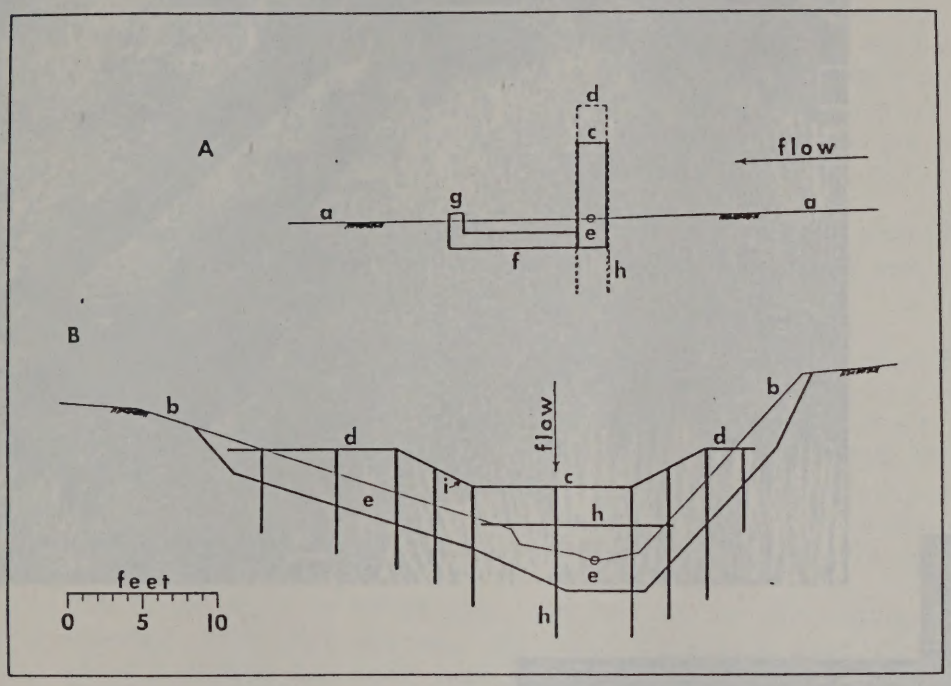
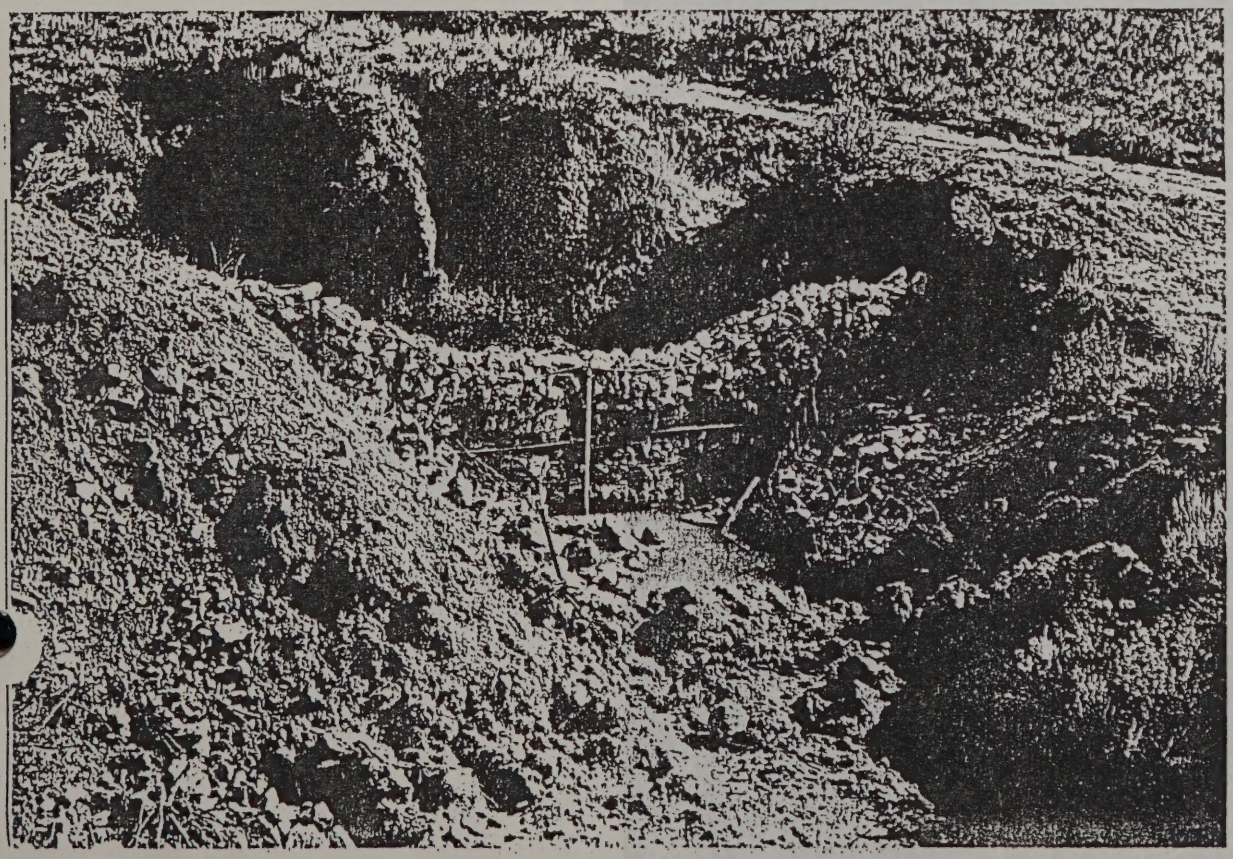


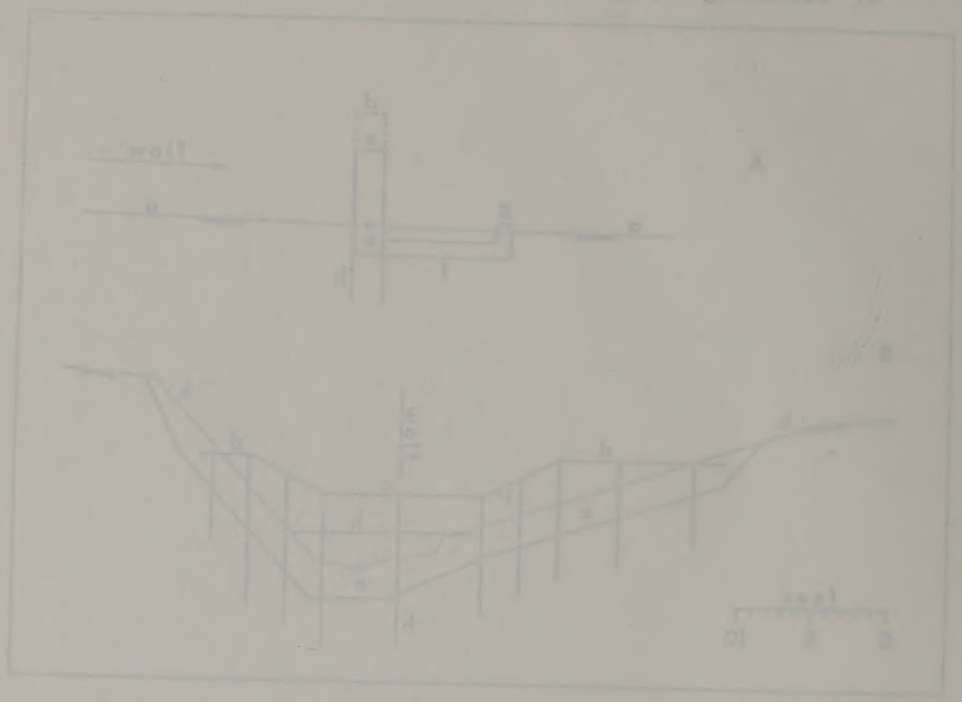
Figure . --The construction plans for the double-fence rock check dam shown in figure 6b.
A. Section of the dam parallel to the centerline of the gully.
B. Section of the dam at the cross section of the gully.



a = original gully bottom
b = original gully cross section
c = spillway
d = crest of freeboard
e = excavation for key
f = excavation for apron
g = end sill
h = steel fencepost
i = re-bar, 0.5 inch in diameter

Figure . --Looking upstream at a double-fence rock check dam with an effective height of 5.5 feet. Water is still standing on the apron. A small flow developed from a light storm 1 day before this photo was taken. Dam construction was finished only 1 day before the storm.





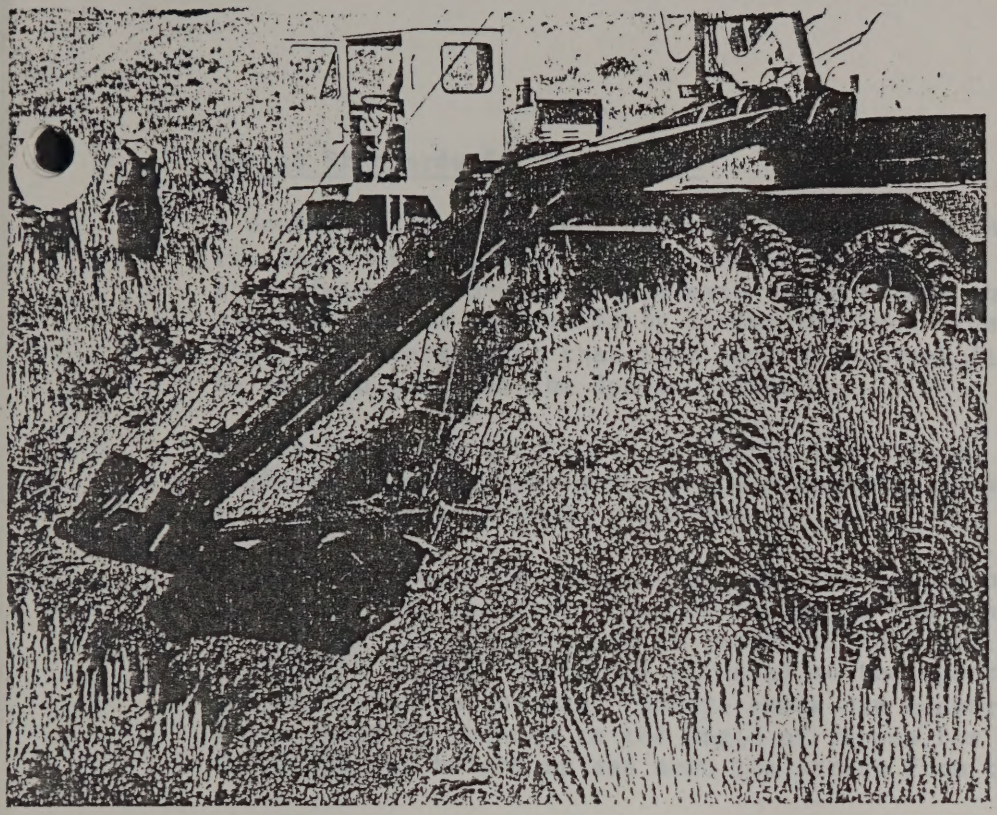


Figure .--
This backhoe excavated the keys for check dams where gully cross sections were small and the construction sites easily accessible.

Figure .--
The effective height of check dams influences not only the volume of future depositions, but also the spacing of structures. These double-fence rock check dams were installed on a gradient of 12.5 percent.

Design Standards for Check Dams

A double-fence rock check dam will be used when the dam height is between two and four feet high. This type of dam has two wire-mesh fences, strung at a distance 1.5-2 feet from each other across the channel. Porosity of the dams can be controlled by lining the back side with filter fabric. When dams are greater than four feet high, rock filled gabion baskets will be used in place of the double fence.

Before check dam construction begins, the channel should be cleared of any boulders or other debris which could obstruct flow and threaten to initiate lateral channel migration.

Check dams should be laid out so the line of discharge from the spillway is parallel to the centerline of the gully immediately below the structure. In addition, it is essential that the check dam be located in a straight channel reach and situated so the upstream direction of flow is perpendicular to the dam. Before check dam construction begins, the gully walls would be reduced to the angle of repose for a distance of at least twice the dam height up and down the stream from the dam.

The first step in check dam construction is excavating a key into the channel banks and bottom. On check dams less than five feet wide, the key should extend two feet into the gully banks and one foot into the gully bottom. On dams greater than five feet wide the channel bank keys should be increased to 2.5 feet. Excavating a key is not necessary when bedrock is encountered.

Once the keys are completed, the filter fabric will be laid down and secured, and the fence posts or gabion baskets are placed. Fence posts used in double-fence dams should never be spaced further than three feet apart.

The wire mesh (woven wire or field wire) or gabion wire baskets should resist corrosion, be strong enough to withstand pressures exerted by rocks and water flows, and have openings no larger than the average rock size in the dam (ideally 6-10 inches in diameter).

The size and shape of the check dam spillway is crucial because it determines the rehabilitated channel dimensions and the depth and the extent of sediment deposits behind the check dams. In order to reclaim the gully, the spillways would be designed to safely handle the bankful discharge of the natural channel. This flow rate is equivilent to the flood with a 10 year recurrence interval. This would be a flow of 160 - 200 cubic feet per second. To second. To maximize dam height and sediment deposition, the spillway whould be as flat and broad as possible.

Aprons (Fig. 7b.) would be constructed of rock, in the channel directly downstream from each check dam. The aprons would extend at least 1.5-2 times the spillway height downstream. At the downstream end of the apron, a rock sill would be built no more than five inches high as measured from the channel bottom to the top of the sill.

Design Standards for Gabion-Drop Structures

The standard galvanized gabion baskets have a 3 inch x 4 inch hexagonal mesh opening. There are several size gabions available. The smallest size for the drop structure weirs available are 6 ft. long x 3 ft. wide x 3 ft. deep. The smallest gabion for apron use is 6 ft. long x 3 ft. wide x 1 ft. deep. The following drawings from Terra Agua Gabions illustrates their installation:

PACKING & ASSEMBLY

PACKING

For ease of handling and shipping the gabions are supplied folded flat.

A color stripe applied on the side of each folded gabion identifies the size.

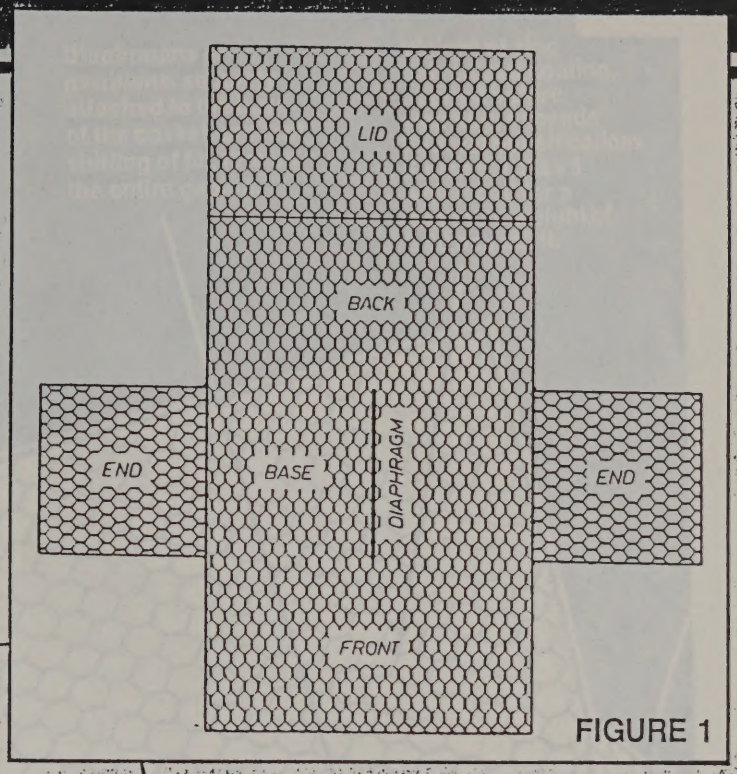


FIGURE 1

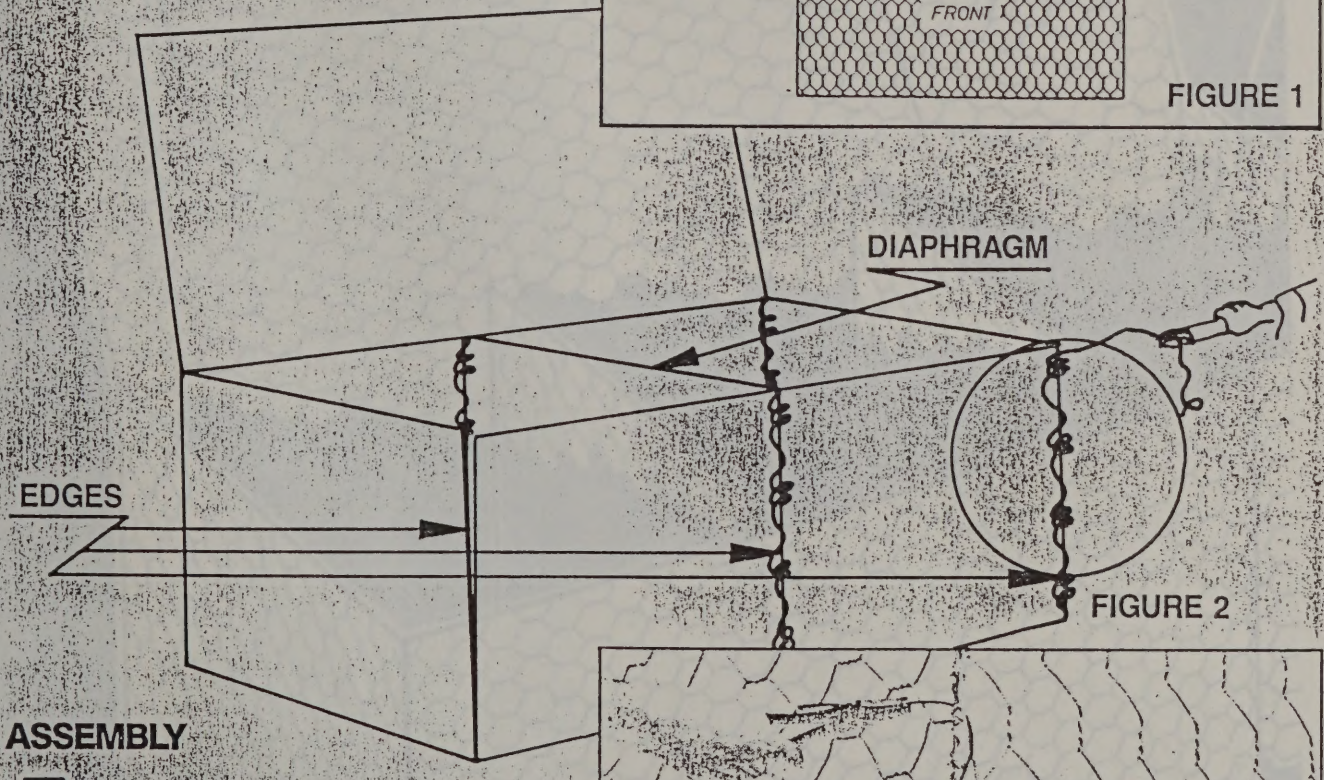
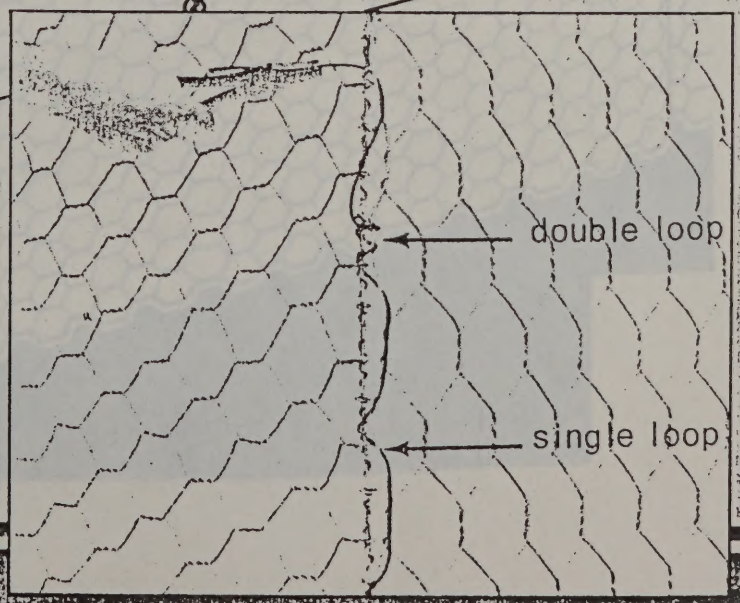
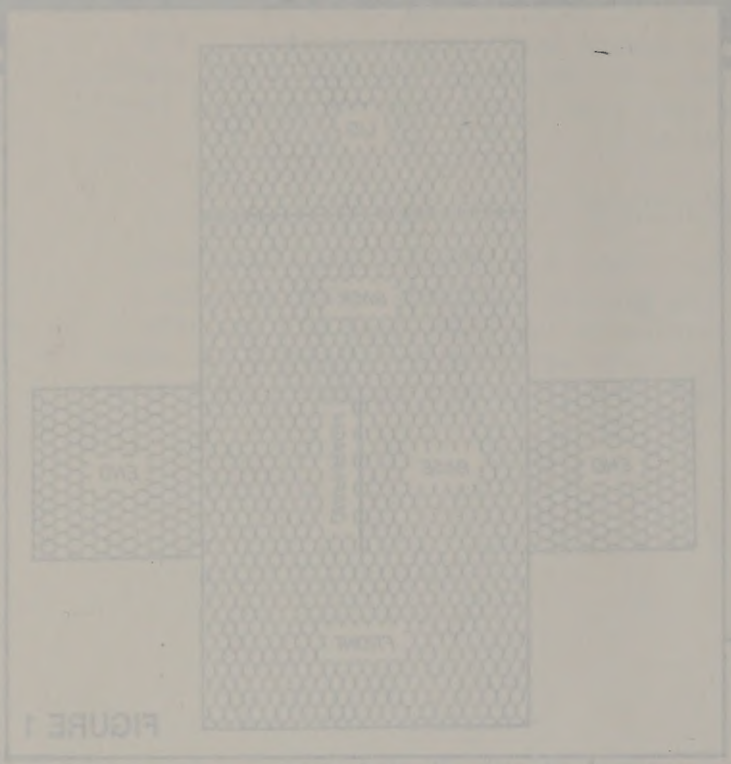


FIGURE 2

ASSEMBLY

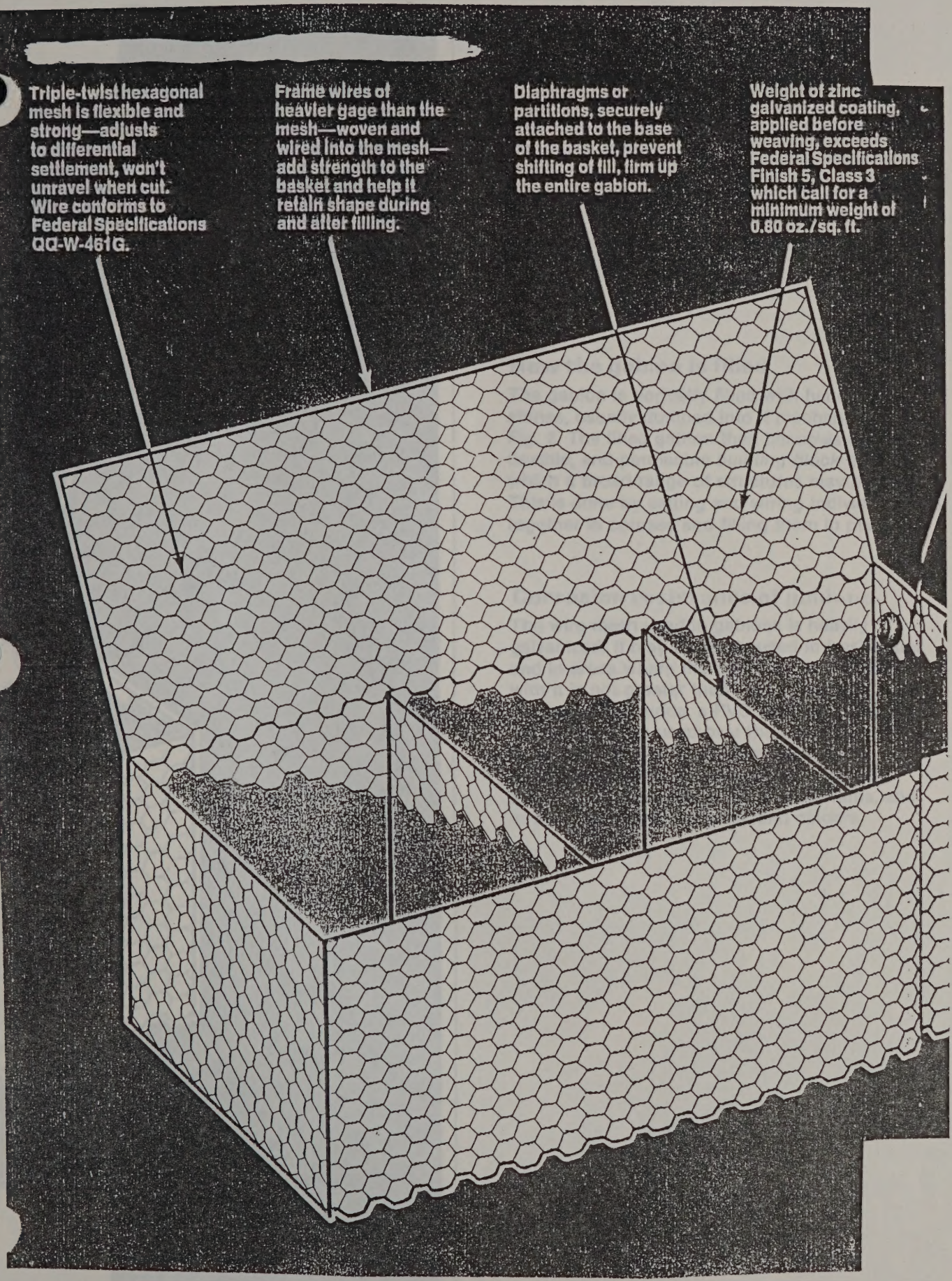
1. Open the bundle and unfold each unit. See Figure 1.
2. Lift the sides, the ends and the diaphragms of each unit into vertical position. Figure 2.
3. Wire the edges of four corners together and the diaphragms to the front and back of the gabion. Figure 2 and 3.

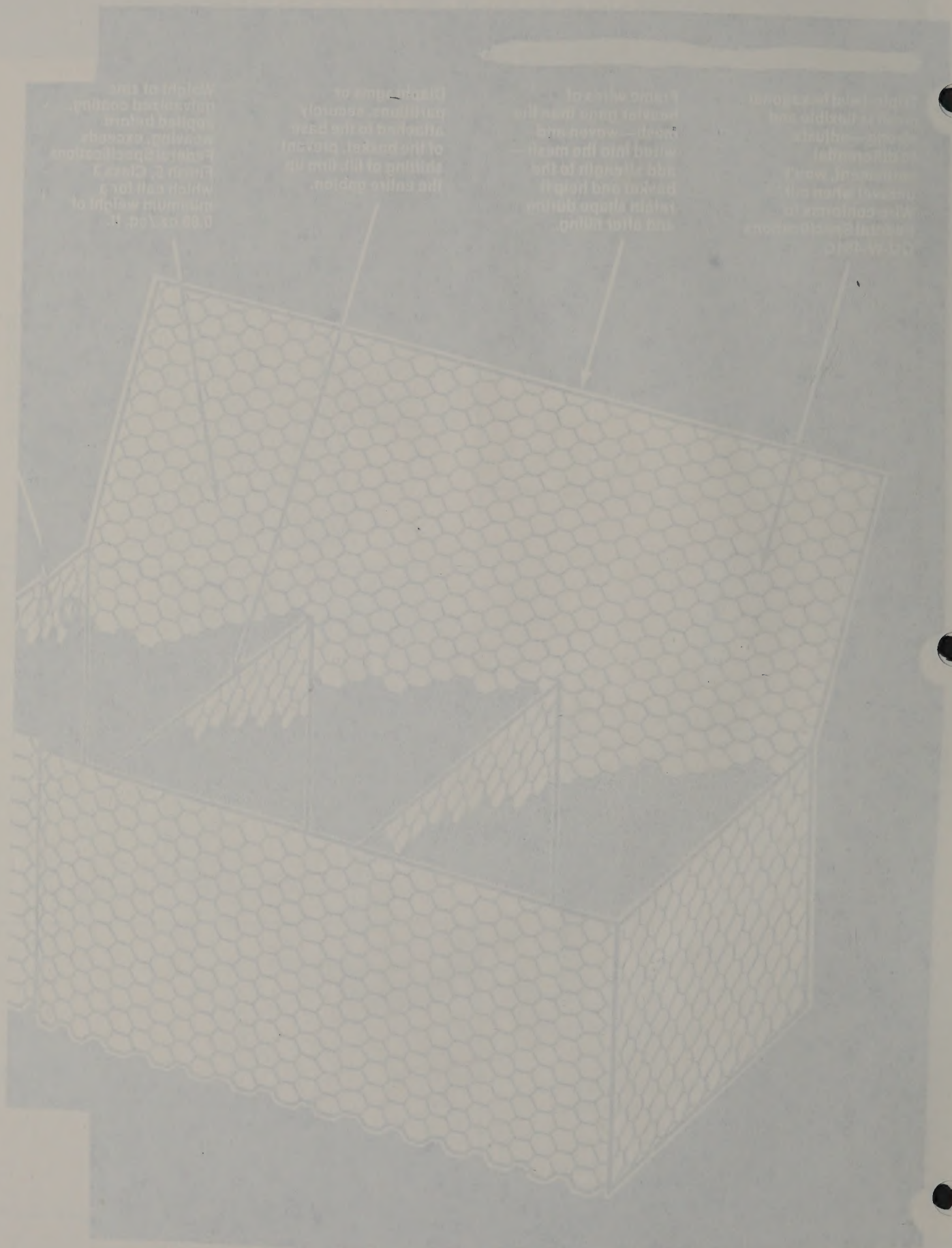


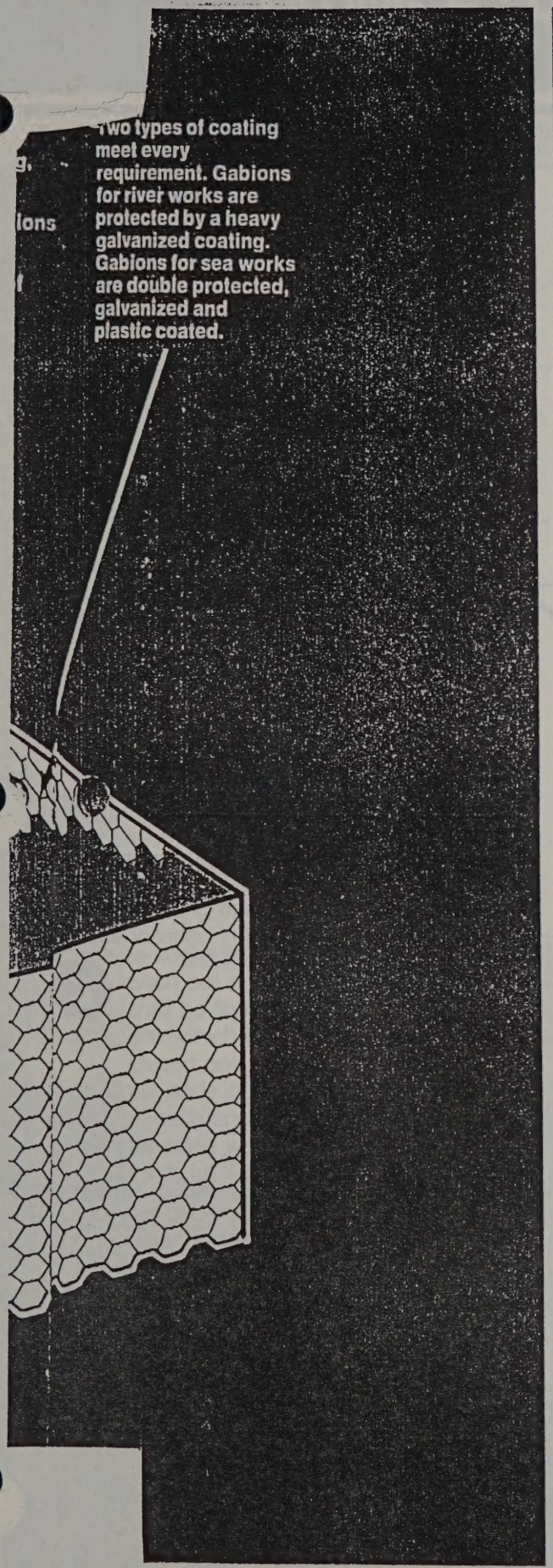


DIAPHRAGM

double loop
single loop


Triple-twist hexagonal mesh is flexible and strong—adjusts to differential settlement, won't unravel when cut. Wire conforms to Federal Specifications QQ-W-461G.
Frame wires of heavier gage than the mesh—woven and wired into the mesh—add strength to the basket and help it retain shape during and after filling.
Diaphragms or partitions, securely attached to the base of the basket, prevent shifting of fill, firm up the entire gabion.
Weight of zinc galvanized coating, applied before weaving, exceeds Federal Specifications Finish 5, Class 3 which call for a minimum weight of 0.80 oz./sq. ft.



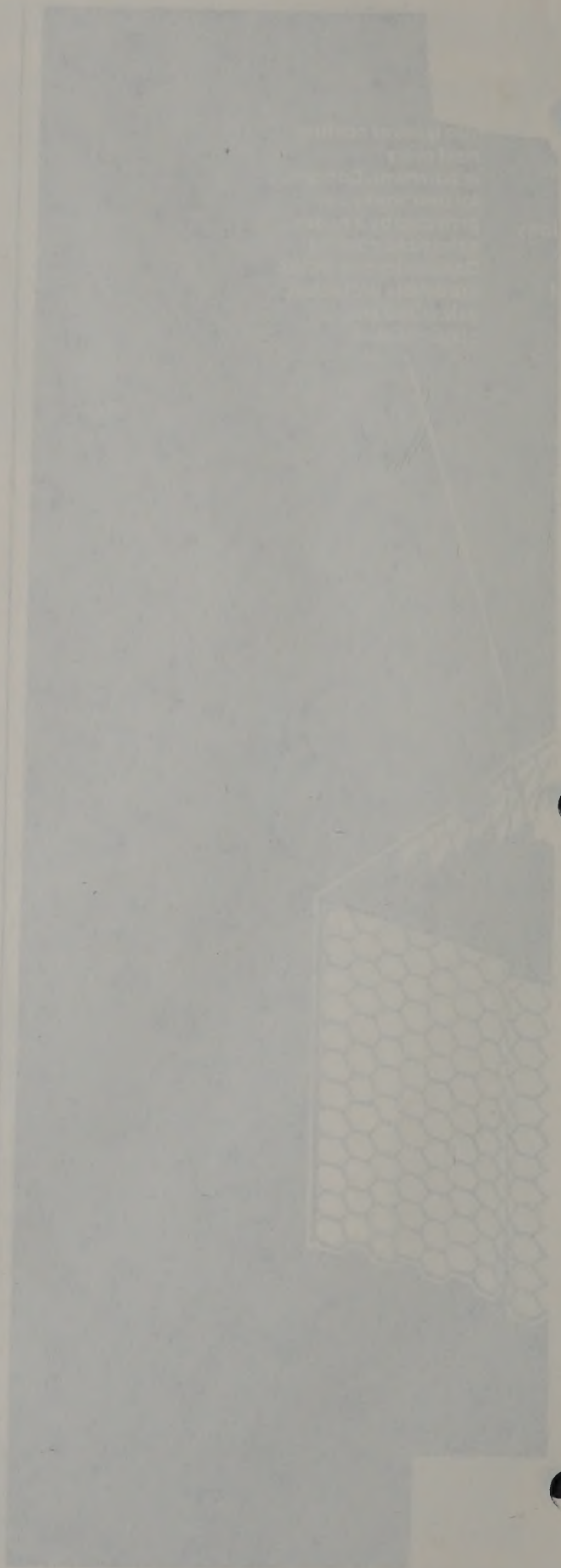

Two types of coating meet every requirement. Gabions for river works are protected by a heavy galvanized coating. Gabions for sea works are double protected, galvanized and plastic coated.

How the gabion is filled

The gabion is normally filled with hand-sized stones, usually dumped into it mechanically, Fig. 2. The filled gabion then becomes a large, flexible, and permeable *building block* from which a broad range of structures may be built. This is done by setting and wiring individual units together in courses and filling them in place.

Corrosion resistance of gabions

The wire mesh used in gabions is heavily galvanized. It may be safely used in fresh water and in areas where the pH of liquid in contact with it is not greater than 11. For highly corrosive conditions, a PVC (polyvinyl chloride) coating must be used over the galvanizing. Such treatment is an economical solution to deterioration of the wire near the ocean, in some industrial areas, in polluted streams, and in soils such as muck, peat, and cinders.



FILLING & CONNECTING WIRES

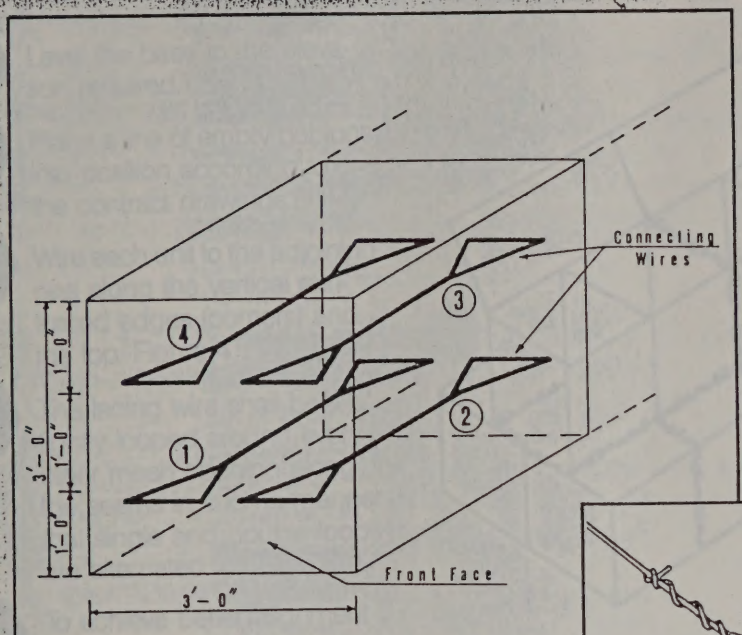


FIGURE 6

FILLING

1. The material used to fill the gabions must be 4″ to 8″ durable stone.
2. The filling operation can be carried out with any type of machinery. Every effort shall be made to keep voids and bulges in the gabions to a minimun in order to ensure proper alignment and neat, compact, square appearance. Also, on the exposed area of retaining structures the stone should be carefully placed.

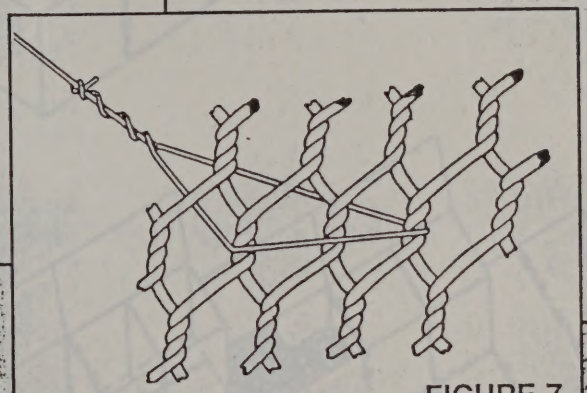


FIGURE 7

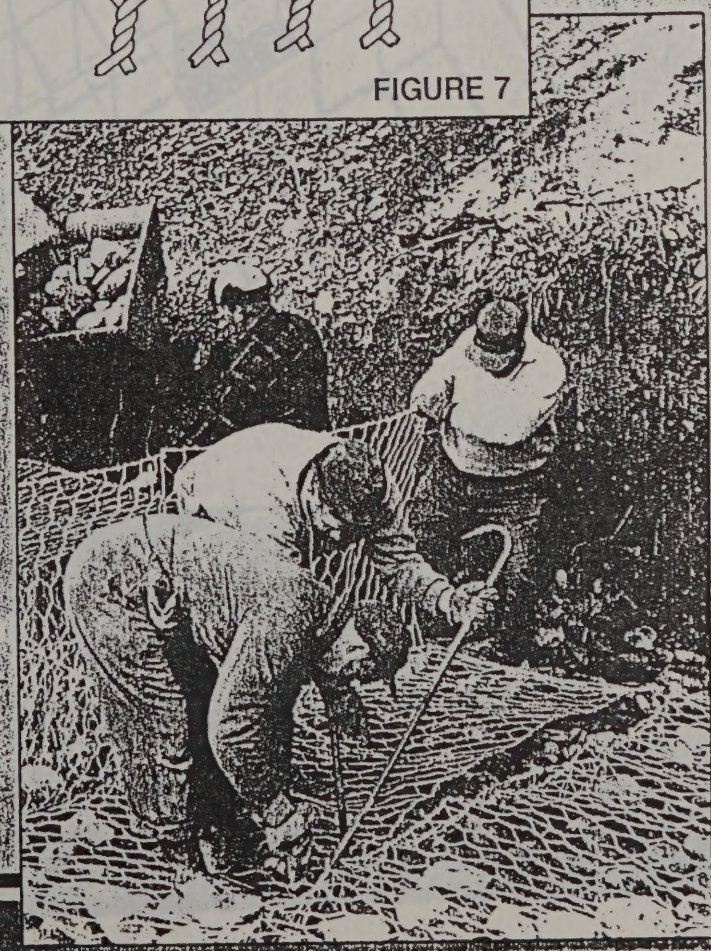
CONNECTING WIRES

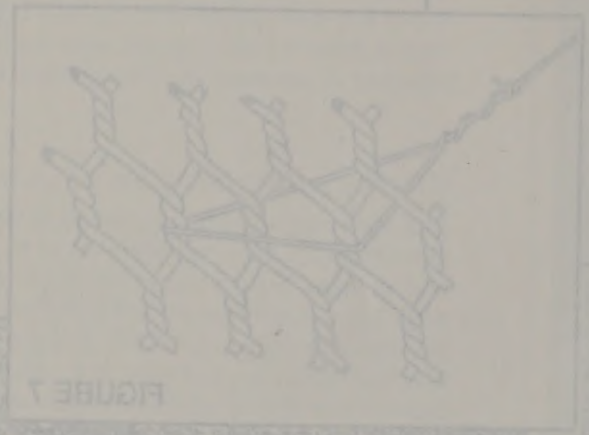
During the filling operation connecting wires shall be inserted in the following manner.

3. Each cell of the 36″ high gabion shall be filled to a depth of one third after which connecting wires are placed one in each direction with the ends looped around two meshes at each end. This operation shall be repeated when the gabion is two thirds full.

For thinner gabions, connecting wires are not necessary unless the 18″ are used to build vertical structures and in this case two wires, one in each direction at 9″ from the base, must be placed as above.

4. After the filling operation has been completed the lid shall be bent to meet the front and ends and tightly bound to the rest of the gabion with the lacing wire along all edges and top of diaphragms in the same manner used to assemble the gabions.





INSTALLATION

1. Level the base to the elevation required.
2. Place a line of empty gabions into position according to the contract drawings.
3. Wire each unit to the adjoining one along the vertical reinforced edges (corners) and the top. Figure 4.
4. The lacing wire shall be tightly looped around every other mesh opening along the seams in such a manner that single and double loops are alternated.
5. To achieve better alignment and finish in retaining walls, after a line of gabions has been wired together, stretching is recommended.
6. Empty gabion sections placed on top of completed sections must be wired to filled section at front and back. Figure 4.

When the upper section only partially overlaps the lower section, the wiring will be done at the point where the front edge of the upper section meets the lower section, and where the back edge of the lower section meets the base of the upper section. See Figure 5.

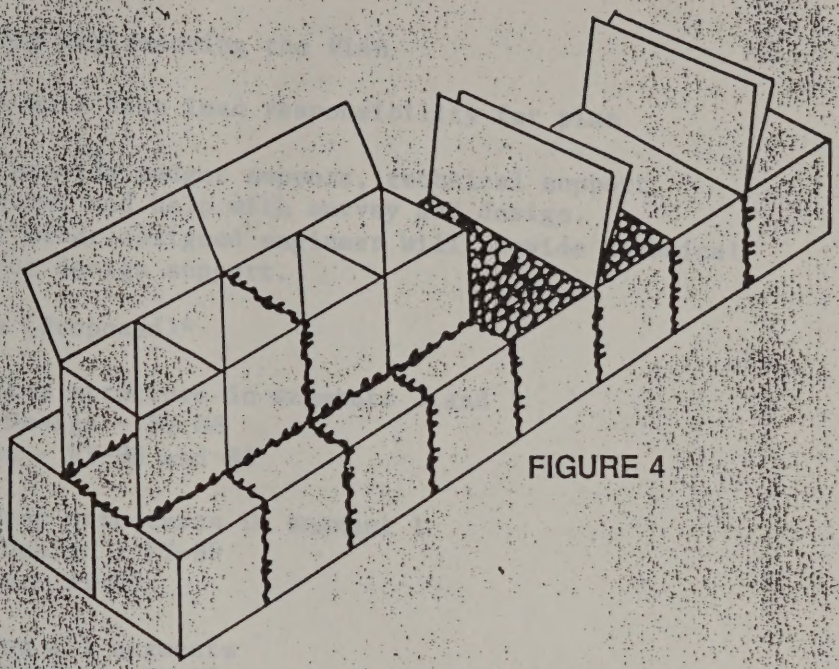


FIGURE 4

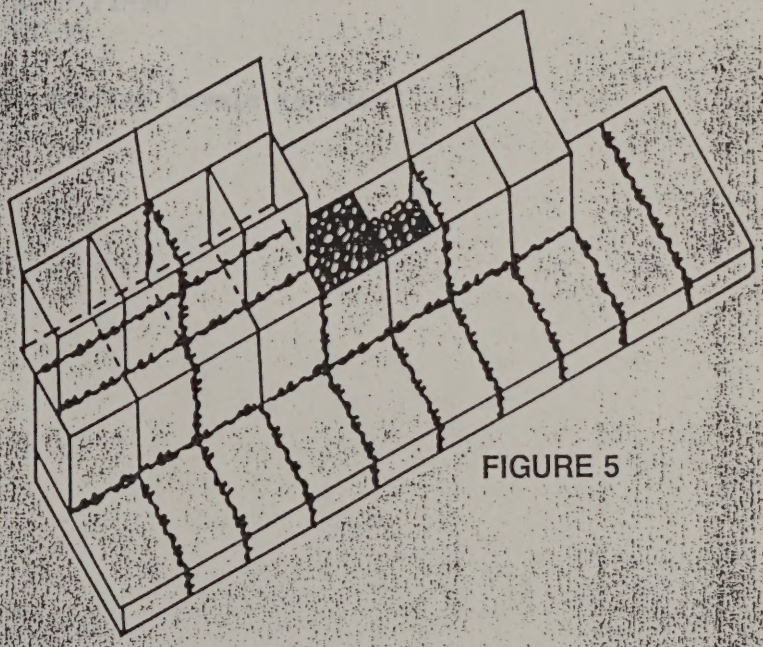
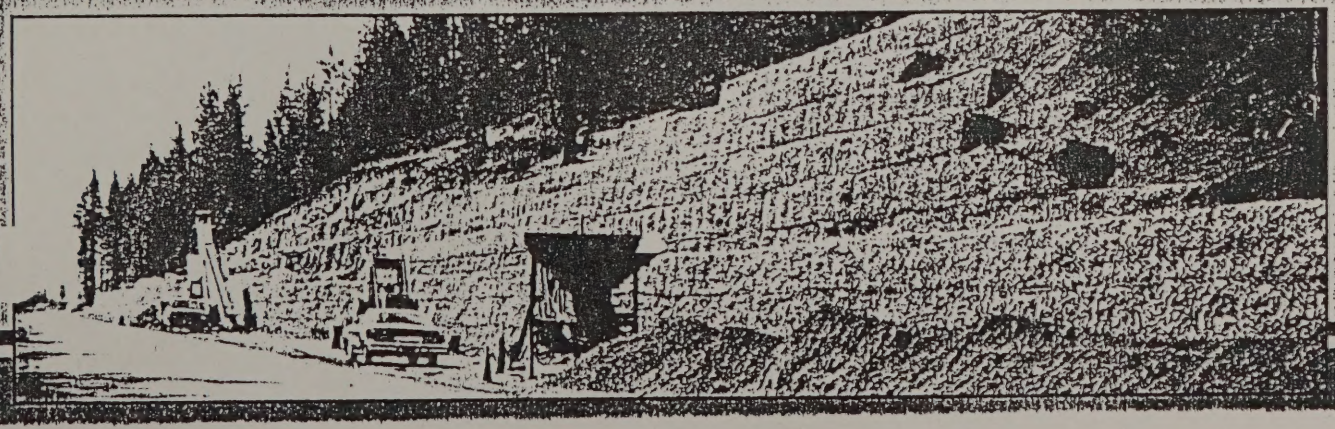
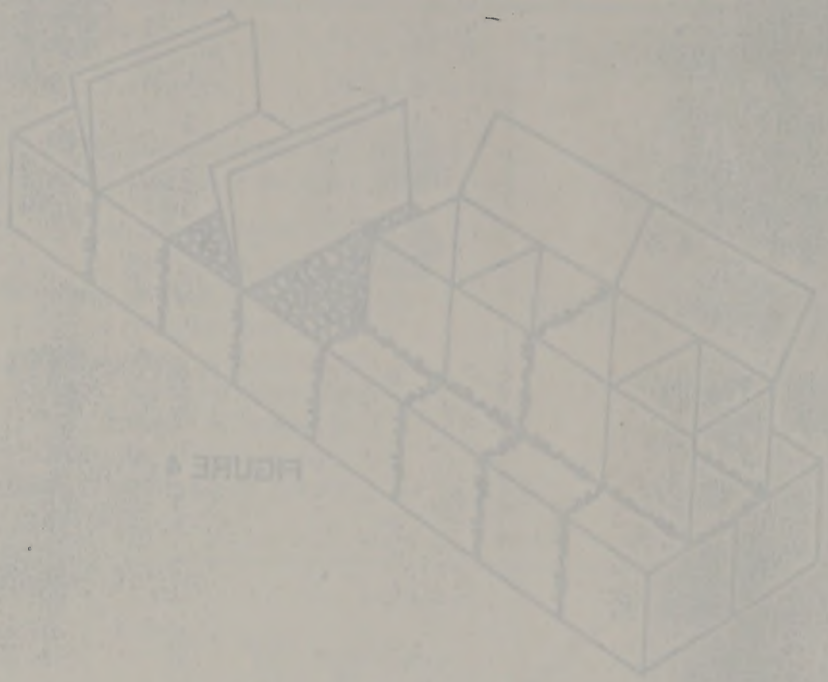


FIGURE 5





J. Plan Implementation

1. Responsibility for Implementing the Plan

Dwain W. Vincent will have lead responsibility for plan implementation.
Jerry Wall will provide budget support, technical support, feasibility support, and help with survey and design.
Ernest Chavez or other assigned engineer will provide technical engineering and/or design support.

2. Project Schedule (Proposed)*

a. Headcut - drop structure in segments 3 and 5
Survey and Design - FY-88
Construction - FY-88 and 89

b. Headcut - drop structures in segment 1
Survey and Design - FY-89
Construction - FY-90

c. Check dams on all segments
Survey and Design - FY-90
Construction - FY-91

* This schedule will depend on funding levels in 4341

References

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2. Heede, Burchard H., "A Study of Early Gully-Control Structures in the Colorado Front Range." Station Paper No. 55, USDA, USFS, Rocky Mt. Forest & Range Experiment Station, Ft. Collins, Co., Dec. 1960.

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4. Heede, Burchard H., "Gully Control: Determining Treatment Priorities for Gullies in A Network; Environmental Management, Vol. 6, No. 5, pp. 441-451. USDA, USFS, Rocky Mt. Forest and Range Experiment Station, Forestry Sciences Laboratory, Arizona State University Campus, Tempe, Arizona 85287.

5. Hunt, Charles B., "Surface Geology of Northwest New Mexico" New Mexico Institute of Mining and Technology, New Mexico Bureau of Mines and Mineral Resources, 1978.

6. USDA, Soil Conservation Service, "Soil Survey, Cabezon Area, New Mexico. Jan. 1988.

7. USDA, Soil Conservation Service, "Soil Survey of Rio Arriba, Sandoval and McKinley Counties, Interim Report, Sept. 1977.

8. USDA, Soil Conservation Service, "Technical Site Descriptions for New Mexico and Arizona Playsaus and Mesas, Sub-Resource Areas MP-1 and MP-2, March 1978 to March 1984.

9. USGS, U.S. Geological Survey, Washington, D.C. 1900, "Geologic Map of the Torreon Trading Post Quadrangle, Sandoval County, New Mexico by Jim Rhode.

10. USDI, Bureau of Land Management, "The Proposed Rio Puerco Livestock Grazing Management Program, Final Environmental Statement, Sept. 1977.

11. USDI Bureau of Land Management, D. Murphy and R. Ypsilantis, "Torreon Gulch Watershed Activity Plan", Montrose, Colorado District April 21, 1985.

References

1. Gray H. Donald and Leiser Andrew T., "Biotechnical Slope Protection and Erosion Control", Van Nostrand Reinhold Company Inc., 1982.

2. Heede, Burchard H., "A Study of Early Gull-Control Structures in the Colorado Front Range." Station Paper No. 55, USDA, USFS, Rocky Mt. Forest & Range Experiment Station, Ft. Collins, Co., Dec. 1960.

3. Heede, Burchard H., "Design, Construction and Cost of Rock Check Dams", U.S. Forest Service Research Paper RM -20, USDA, USFS, Rocky Mt. Forest & Range Experiment Station, Ft. Collins, Co. May 1966, Reprinted June 1970.

4. Heede, Burchard H., "Gully Control: Determining Treatment Priorities for Gullies In A Network; Environmental Management, Vol. 6, No. 5, pp. 441-451. OSDA, USFS, Rocky Mt. Forest and Range Experiment Station, Forestry Sciences Laboratory, Arizona State University Campus, Tempe, Arizona 85287.

5. Hunt, Charles B., "Surface Geology of Northwest New Mexico" New Mexico Institute of Mining and Technology, New Mexico Bureau of Mines and Mineral Resources, 1978.

6. USDA, Soil Conservation Service, "Soil Survey, Cabezon Area, New Mexico, Jan. 1968.

7. USDA, Soil Conservation Service, "Soil Survey of BLM Lands, Sandoval and McKinley Counties, Interim Report, Sept. 1977.

8. USDA, Soil Conservation Service, "Technical Site Descriptions for New Mexico and Arizona Plateaus and Mesas, Sub-Resource Areas WP-1 and WP-2, March 1978 to March 1984.

9. USDI, U.S. Geological Survey, Washington, D.C. 1966, "Geologic Map of the Johnson Trading Post Quadrangle, Sandoval County, New Mexico by Jim Hinds.

10. USDI, Bureau of Land Management, "The Proposed Rio Puerco Livestock Grazing Management Program, Final Environmental Statement, Sept. 1977.

11. USDI Bureau of Land Management, D. Murphy and B. Ypsilantis, "Long Gulch Watershed Activity Plan", Montrose, Colorado District April 27, 1985.

Appendix

There are approximately 4 springs and two wells within the watershed. They are listed as follows:

JDR No.	Name	Location			
		40 Acre	Section	Township	Range
	Pine Spring	NE,NW,NE	35	21N.	3W.
	Dry Spring	NE,NW,SW	16	21N.	3W.
0378	Spring	NE,SE,SW	16	21N.	3W.
	Taylor Ranch Well	NW,NW,SE	10	21N.	3W.
	Well	NW,NE,NE	34	21N.	3W.

There are approximately 24 reservoirs, detention and retention dams within the watershed. The following is a list of surface waters:

JDR No.	Status	Location			
		40 Acre	Section	Township	Range
	Public	NW,SW,SE	14	21N.	3W.
	Public	SE,SW,SE	26	21N.	3W.
	Public	NW,NE,NE	35	21N.	3W.
	Public	SW,NW,NW	25	21N.	3W.
3520	Public	NW,NE,SW	25	21N.	3W.
	Public	SE,SW,SE	36	21N.	3W.
	Private	NW,NW,SE	10	21N.	3W.
	Private	NW,NW,SE	10	21N.	3W.
	Private	SW,NW,SE	10	21N.	3W.
	Private	SW,SW,SE	10	21N.	3W.
	Private	SW,SW,SE	10	21N.	3W.
	Public	SW,SE,NE	16	21N.	3W.
	Public	SE,NE,SE	16	21N.	3W.
	Public	SE,SW,NW	15	21N.	3W.
	Public	NW,SE,SE	19	21N.	3W.
	Public	NE,SE,SE	20	21N.	3W.
	Public	NW,SE,NW	21	21N..	3W.
	Public	SE,SE,NW	22	21N.	3W.
0306	Public	NE,NE,NW	29	21N.	3W.
	Public	SW,NE,SW	29	21N.	3W.
0976	Public	NE,SE,SE	28	21N.	3W.
3523	Public	SE,NE,NE	27	21N.	3W.
1677	Public	SW,NE,NE	33	21N.	3W.
	Public	SW,SW,NE	4	20N.	3W.

Appendix

Appendix

PAGE ONE

RANGELAND INVESTMENT ANALYSIS
****

DATE:02/01/88
TIME:15.701

STATE: NM
DISTRICT: ALBUQUERQUE
RESOURCE AREA:RIO-PUERCO

ALLOT NO: 0401
ALLOT NAME: SAN-ISIDRO-WATERSHED

PROGRAM IDENT:RPES
BASE YEAR:1984

DATA PREPARED BY:XX VINCENT
-RANGE CONS. XX
-MON/WAT XX
-WILDLIFE BIOL. XX
-XX

EXISTING PROGRAM COST DATA
****

STRUCTURAL PROJECTS	UNITS		TOTAL ANNUAL MAINT. COST	
SPRINGS	4.0	NO	$ 200	0%BLM
RESERVOIRS	24.0	NO	$ 1200	0%BLM
WELLS	2.0	NO	$ 500	0%BLM
PIPELINES	2.0	MI	$ 200	0%BLM
FENCES	29.0	MI	$ 1450	0%BLM
CATTLEGUARDS	6.0	NO	$ 300	0%BLM

NONSTRUCTURAL PROJECTS		NUMBER OF UNITS BY AGE GROUP						LIFE SPAN (YRS)		TOTAL REPLACEMENT COST	%BLM
		1-5	6-10	11-15	16-20	21-25	+ 25				
MECH.CTRL.	AC	0	0	0	640	0	0	8	$	5120	50
CHEM.CTRL.	AC	0	0	0	0	0	0	0	$	0	0
BURNING	AC	0	0	0	0	0	0	0	$	0	0
SEEDING	AC	0	0	0	0	0	0	0	$	0	0

EXISTING PROGRAM BENEFIT DATA
****

ANNUAL OUTPUTS	BASE LEVEL	FIRST LEVEL UNITS	FIRST LEVEL YR	SECOND LEVEL UNITS	SECOND LEVEL YR	THIRD LEVEL UNITS	THIRD LEVEL YR	FOURTH LEVEL UNITS	FOURTH LEVEL YR
LIVESTOCK (AUMS)	2472	0	0	0	0	0	0	0	0
DEER (HUNTING DAYS)	19	0	0	0	0	0	0	0	0
ELK (HDS)	4	0	0	0	0	0	0	0	0
ANTELOPE (HDS)	0	0	0	0	0	0	0	0	0
OTH.BIG GAME (HDS)	0	0	0	0	0	0	0	0	0
WATERFOWL (HDS)	0	0	0	0	0	0	0	0	0
UPLAND&SMALL GAME	0	0	0	0	0	0	0	0	0
WARM WATER (ADS)	0	0	0	0	0	0	0	0	0
COLD WATER (ADS)	0	0	0	0	0	0	0	0	0
DEVLPD SITE (RDS)	0	0	0	0	0	0	0	0	0
DISPERSE USE (RDS)	4	0	0	0	0	0	0	0	0
NONGAME WLDF (RDS)	0	0	0	0	0	0	0	0	0
SOIL AND WATER ($)	~~-684~~ ~~[illegible]~~	0	0	0	0	0	0	0	0

0% OF LIVESTOCK AUMS ARE AVAILABLE BETWEEN 0/ 0 & 0/ 0 AT THE FINAL LEVEL

This page includes values for entire watershed – (4 grazing allotments)

PAGE ONE

RANGELAND INVESTMENT ANALYSIS

DATE:02/04/88
TIME:13.839

STATE: NM
DISTRICT: ALBUQUERQUE
RESOURCE AREA:RIO-PUERCO

ALLOT NO: 0402
ALLOT NAME: SAN-ISIDRO-WATERSHED

PROGRAM IDENT:RPES
BASE YEAR:1984

DATA PREPARED BY:XX VINCENT
-RANGE CONS. XX
-MON/WATER XX
-WILDLIFE BIOL. XX
-XX

EXISTING PROGRAM COST DATA

STRUCTURAL PROJECTS	UNITS		TOTAL ANNUAL MAINT. COST	
SPRINGS	0.	NO	$ 0	0%BLM
RESERVOIRS	0.	NO	$ 0	0%BLM
WELLS	0.	NO	$ 0	0%BLM
PIPELINES	0.	MI	$ 0	0%BLM
FENCES	0.	MI	$ 0	0%BLM
CATTLEGUARDS	0.	NO	$ 0	0%BLM

NONSTRUCTURAL PROJECTS		NUMBER OF UNITS BY AGE GROUP					+ 25	LIFE SPAN (YRS)		TOTAL REPLACEMENT COST	%BLM
		1-5	6-10	11-15	16-20	21-25					
MECH.CTRL.	AC	0	0	0	0	0	0	0	$	0	0
CHEM.CTRL.	AC	0	0	0	0	0	0	0	$	0	0
BURNING	AC	0	0	0	0	0	0	0	$	0	0
SEEDING	AC	0	0	0	0	0	0	0	$	0	0

EXISTING PROGRAM BENEFIT DATA

ANNUAL OUTPUTS	BASE LEVEL	FIRST LEVEL UNITS	FIRST LEVEL YR	SECOND LEVEL UNITS	SECOND LEVEL YR	THIRD LEVEL UNITS	THIRD LEVEL YR	FOURTH LEVEL UNITS	FOURTH LEVEL YR
LIVESTOCK (AUMS)	2472	0	0	0	0	0	0	0	0
DEER (HUNTING DAYS)	0	0	0	0	0	0	0	0	0
ELK (HDS)	0	0	0	0	0	0	0	0	0
ANTELOPE (HDS)	0	0	0	0	0	0	0	0	0
OTH.BIG GAME (HDS)	0	0	0	0	0	0	0	0	0
WATERFOWL (HDS)	0	0	0	0	0	0	0	0	0
UPLAND&SMALL GAME	0	0	0	0	0	0	0	0	0
WARM WATER (ADS)	0	0	0	0	0	0	0	0	0
COLD WATER (ADS)	0	0	0	0	0	0	0	0	0
DEVLPD SITE (RDS)	0	0	0	0	0	0	0	0	0
DISPERSE USE (RDS)	0	0	0	0	0	0	0	0	0
NONGAME WLIFE (RDS)	0	0	0	0	0	0	0	0	0
SOIL AND WATER ($)	-684	0	0	0	0	0	0	0	0

0% OF LIVESTOCK AUMS ARE AVAILABLE BETWEEN 0/ 0 & 0/ 0 AT THE FINAL LEVEL

DATA PREPARED BY:XX -RANGE CONS. XX -WILDLIFE BIOL.
VINCENT -MON/WATER XX -XX

ALTERNATIVE PROGRAM COST DATA

PROGRAM IDENT: RPPA

STRUCTURAL PROJECTS	NEW UNITS		CONSTRUCTION COSTS BY YEAR --1--	--2--	--3--	--4--	--5--	%BLM	MAINTENANCE BEG YR	ANN COST	% BLM	REPLACEMT LIFE	COST
SPRINGS	0.	NO	0	0	0	0	0	0	0	0	0	0	0
RESERVOIRS	0.	NO	0	0	0	0	0	0	0	0	0	0	0
WELLS	0.	NO	0	0	0	0	0	0	0	0	0	0	0
PIPELINES	0.	MI	0	0	0	0	0	0	0	0	0	0	0
FENCES	0.	MI	0	0	0	0	0	0	0	0	0	0	0
CATTLEGUARDS	0.	NO	0	0	0	0	0	0	0	0	0	0	0
GABION-DS	38.0	NO	2556	2769	0	0	0	100	0	0	100	50	8094
CHECKDAMS	79.0	NO	2025	1950	0	0	0	100	0	0	100	50	5925

NONSTRUCTURAL PROJECTS	NEW UNITS		CONSTRUCTION COST BY YEAR --1--	--2--	--3--	--4--	--5--	%BLM	REPLACEMENT LIFE	COST	%BLM
MECH.CTRL.	0	AC	0	0	0	0	0	0	0	0	0
CHEM.CTRL.	0	AC	0	0	0	0	0	0	0	0	0
BURNING	0	AC	0	0	0	0	0	0	0	0	0
SEEDING	0	AC	0	0	0	0	0	0	0	0	0

MANAGEMENT COSTS:	-INITIAL-		-ANNUAL-	
COOPERATOR	0 DAYS - $	0	0 DAYS - $	0
BLM	0 DAYS - $	0	0 DAYS - $	0

ALTERNATIVE PROGRAM BENEFIT DATA

ANNUAL OUTPUTS	BASE LEVEL	FIRST LEVEL UNITS	YR	SECOND LEVEL UNITS	YR	THIRD LEVEL UNITS	YR	FOURTH LEVEL UNITS	YR
LIVESTOCK (AUMS)	2472	2547	12	2696	18	0	0	0	0
DEER (HUNTING DAYS)	0	0	0	0	0	0	0	0	0
ELK (HDS)	0	0	0	0	0	0	0	0	0
ANTELOPE (HDS)	0	0	0	0	0	0	0	0	0
OTH.BIG GAME (HDS)	0	0	0	0	0	0	0	0	0
WATERFOWL (HDS)	0	0	0	0	0	0	0	0	0
UPLAND&SMALL GAME	0	0	0	0	0	0	0	0	0
WARM WATER (ADS)	0	0	0	0	0	0	0	0	0
COLD WATER (ADS)	0	0	0	0	0	0	0	0	0
DEVLPD SITE (RDS)	0	0	0	0	0	0	0	0	0
DISPERSE USE (RDS)	0	0	0	0	0	0	0	0	0
NONGAME WLDF (RDS)	0	0	0	0	0	0	0	0	0
SOIL AND WATER ($)	-684	-564	3	0	12	0	0	0	0

0% OF LIVESTOCK AUMS ARE AVAILABLE BETWEEN 0/ 0 & 0/ 0 AT THE FINAL LEVEL

RANGELAND INVESTMENT ANALYSIS SUMMARY
****

DATE: 02/04/88
TIME: 13.839

STATE: NM
DISTRICT: ALBUQUERQUE
RESOURCE AREA: RIO-PUERCO
ALLOT NO: 0402
ALLOT NAME: SAN-ISIDRO-WATERSHED
PROGRAM IDENT: RPPA
BASE YEAR: 1984

ANNUAL YIELD, UNIT VALUES, AND PRESENT VALUES (8.625%)
****

OUTPUT CATEGORY	UNIT	BASE YIELD	SUSTAINED YIELD W/O	SUSTAINED YIELD WITH	UNIT VALUES	PRESENT VALUE OF CHANGE
LIVESTOCK FORAGE(AVERAGE)	AUM	2472	2472	2696	6.63	4851
LIVESTOCK FORAGE(SEASONAL)	AUM	2472	2472	2696	6.63	0
DEER HUNTING	HDS	0	0	0	50.00	0
ELK HUNTING	HDS	0	0	0	50.00	0
ANTELOPE HUNTING	HDS	0	0	0	50.00	0
OTHER BIG GAME HUNTING	HDS	0	0	0	50.00	0
WATERFOWL HUNTING	HDS	0	0	0	26.00	0
UPLAND & SMALL GAME	HDS	0	0	0	31.00	0
WARM WATER ANGLING	ADS	0	0	0	21.00	0
COLD WATER ANGLING	ADS	0	0	0	23.00	0
DEVELOPED SITE RECREATION	RDS	0	0	0	21.00	0
DISPERSED USE RECREATION	RDS	0	0	0	21.00	0
NONGAME WILDLIFE VIEWING	RDS	0	0	0	21.00	0
SOIL AND WATER	$'S	-684	-684	0	1.00	4851

INVESTMENT COST SUMMARY (8.625%)
****

PROJECTS	--CONSTR.COST-- ACTUAL	DISCNTD	REPLCMT -MAINTENANCE-- DISCNTD ANN. COST	TOTAL COST	DISCNTED	-------DISCOUNTED COST------- BLM	OTHER	TOTAL
-STRUCTURAL PROJECTS-								
SPRINGS	0	0	0	0	0	0	0	0
RESERVOIRS	0	0	0	0	0	0	0	0
WELLS	0	0	0	0	0	0	0	0
PIPELINES	0	0	0	0	0	0	0	0
FENCES	0	0	0	0	0	0	0	0
CATTLEGUARDS	0	0	0	0	0	0	0	0
GABION-DS	5325	4700	124	0	0	4824	0	4824
CHECKDAMS	3975	3517	93	0	0	3610	0	3610
-NONSTRUCTURAL PROJECTS-								
MECH.CTRL.	0	0	0	0	0	0	0	0
CHEM.CTRL.	0	0	0	0	0	0	0	0
BURNING	0	0	0	0	0	0	0	0
SEEDING	0	0	0	0	0	0	0	0
-MANAGEMENT COSTS-								
INITIAL						0	0	0
ANNUAL						0	0	0
TOTAL	9300	8217	217	0	0	8434	0	8434

[illegible] INVESTMENT ANALYSIS SUMMARY [illegible]
****
TIME: 13.839

STATE: NM
DISTRICT: ALBUQUERQUE ALLOT NO: 0402 PROGRAM IDENT: RPPA
RESOURCE AREA: RIO-PUERCO ALLOT NAME: SAN-ISIDRO-WATERSHED BASE YEAR: 1984

EFFICIENCY TEST RESULTS
****

Sediment and AUMs Total Benefit

EFFICIENCY RATIOS		DISCOUNTED VALUES			
DISCOUNT RATE	BENEFIT/ ALL COST	BENEFIT/ BLM COST	PRESENT NET VALUE(B-C)	TOTAL BENEFIT	COST TOTAL	COST BLM	COST OTHERS
4.000%	2.5 / 1	2.5 / 1	16044	24722	10678	10678	0
* 8.625%	1.2 / 1	1.2 / 1	1270	* 9704	8434	8434	0
10.000%	0.9 / 1	0.9 / 1	-644	7536	8180	8180	0

INTERNAL RATE OF RETURN
****

TOTAL COST	BLM COST	OTHER COST
9.5%	9.5%	*****%

50-YEAR UNDISCOUNTED EXPENDITURES
****

	BLM	OTHER	TOTAL
EXPENDITURES:	22877	0	22877
COST/ADD AUM:	2.92	0.	2.92

BLM BUDGET COSTS FOR FIRST FIVE YEARS
****

	NEW FACILITIES & MANAGEMENT				EXISTING FACILITIES		TOTAL
YEAR	CONST.	O. & M.	MGT.	TOTAL	O. & M.	REPLCMT.	COST
1	4581	0	0	4581	0	0	4581
2	4719	0	0	4719	0	0	4719
3	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0
TOTAL	9300	0	0	9300	0	0	9300

COSTS TO OTHERS	
CONSTRUCTION TOT.:	0

AVERAGE ANNUAL COST

OPER.&MAINTENANCE:	0
ANNUALIZED REPLMT:	0
LIVESTOCK MANGMNT:	0
TOTAL ANNUAL COST:	0

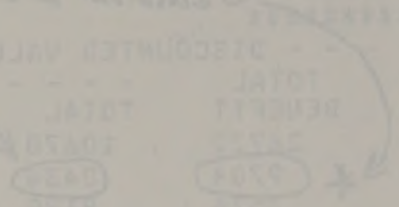
DATA PREPARED BY
****

	EXISTING PROGRAM		ALTERNATIVE PROGRAM	
	XX	-RANGE CONSV.	XX	-RANGE CONSV.
	XX	-WILDLIFE BIO	XX	-WILDLIFE BIO
	VINCENT	-MON/WATER	VINCENT	-MON/WATER
	XX	-XX	XX	-XX

996

(NOTE: ROW AND COLUMN TOTALS MAY NOT SUM CORRECTLY DUE TO ROUNDING.)

****
END OF DETAILED PRINTOUT
****



PAGE ONE RAN AND INVESTMENT ANALYSIS DAT 1/04/88
TIME 14.803

STATE: NM
DISTRICT: ALBUQUERQUE ALLOT NO: 0404 PROGRAM IDENT:RPES
RESOURCE AREA:RIO-PUERCO ALLOT NAME: SAN-ISIDRO-WATERSHED BASE YEAR:1984

DATA PREPARED BY:XX -RANGE CONS. XX -WILDLIFE BIOL.
VINCENT -MON/WATER XX -XX

EXISTING PROGRAM COST DATA

STRUCTURAL PROJECTS	UNITS		TOTAL ANNUAL MAINT. COST		
SPRINGS	0.	NO	$	0	0%BLM
RESERVOIRS	0.	NO	$	0	0%BLM
WELLS	0.	NO	$	0	0%BLM
PIPELINES	0.	MI	$	0	0%BLM
FENCES	0.	MI	$	0	0%BLM
CATTLEGUARDS	0.	NO	$	0	0%BLM

NONSTRUCTURAL PROJECTS		NUMBER OF UNITS BY AGE GROUP					+ 25	LIFE SPAN (YRS)		TOTAL REPLACEMENT COST	%BLM
		1-5	6-10	11-15	16-20	21-25					
MECH.CTRL.	AC	0	0	0	0	0	0	0	$	0	0
CHEM.CTRL.	AC	0	0	0	0	0	0	0	$	0	0
BURNING	AC	0	0	0	0	0	0	0	$	0	0
SEEDING	AC	0	0	0	0	0	0	0	$	0	0

EXISTING PROGRAM BENEFIT DATA

ANNUAL OUTPUTS	BASE LEVEL	FIRST LEVEL UNITS	FIRST LEVEL YR	SECOND LEVEL UNITS	SECOND LEVEL YR	THIRD LEVEL UNITS	THIRD LEVEL YR	FOURTH LEVEL UNITS	FOURTH LEVEL YR
LIVESTOCK (AUMS)	2472	0	0	0	0	0	0	0	0
DEER (HUNTING DAYS)	0	0	0	0	0	0	0	0	0
ELK (HDS)	0	0	0	0	0	0	0	0	0
ANTELOPE (HDS)	0	0	0	0	0	0	0	0	0
OTH.BIG GAME (HDS)	0	0	0	0	0	0	0	0	0
WATERFOWL (HDS)	0	0	0	0	0	0	0	0	0
UPLAND&SMALL GAME	0	0	0	0	0	0	0	0	0
WARM WATER (ADS)	0	0	0	0	0	0	0	0	0
COLD WATER (ADS)	0	0	0	0	0	0	0	0	0
DEVLPD SITE (RDS)	0	0	0	0	0	0	0	0	0
DISPERSE USE (RDS)	0	0	0	0	0	0	0	0	0
NONGAME WLDF (RDS)	0	0	0	0	0	0	0	0	0
SOIL AND WATER ($)	0	0	0	0	0	0	0	0	0

0% OF LIVESTOCK AUMS ARE AVAILABLE BETWEEN 0/ 0 & 0/ 0 AT THE FINAL LEVEL

AUM's benefits only

VINCENT -MON/WATER XX -XX

ALTERNATIVE PROGRAM COST DATA

PROGRAM IDENT: RPPA

STRUCTURAL PROJECTS	NEW UNITS		CONSTRUCTION COSTS BY YEAR --1--	--2--	--3--	--4--	--5--	%BLM	MAINTENANCE BEG YR	ANN COST	% BLM	REPLACEMT LIFE	REPLACEMT COST
SPRINGS	0.	NO	0	0	0	0	0	0	0	0	0	0	0
RESERVOIRS	0.	NO	0	0	0	0	0	0	0	0	0	0	0
WELLS	0.	NO	0	0	0	0	0	0	0	0	0	0	0
PIPELINES	0.	MI	0	0	0	0	0	0	0	0	0	0	0
FENCES	0.	MI	0	0	0	0	0	0	0	0	0	0	0
CATTLEGUARDS	0.	NO	0	0	0	0	0	0	0	0	0	0	0
GABION-DS	38.0	NO	2556	2769	2769	0	0	100	0	0	100	50	8094
CHECK-DAMS	79.0	NO	2025	1950	1950	0	0	100	0	0	100	50	5925

NONSTRUCTURAL PROJECTS	NEW UNITS		CONSTRUCTION COST BY YEAR --1--	--2--	--3--	--4--	--5--	%BLM	REPLACEMENT LIFE	COST	%BLM
MECH.CTRL.	0	AC	0	0	0	0	0	0	0	0	0
CHEM.CTRL.	0	AC	0	0	0	0	0	0	0	0	0
BURNING	0	AC	0	0	0	0	0	0	0	0	0
SEEDING	0	AC	0	0	0	0	0	0	0	0	0

MANAGEMENT COSTS:	-INITIAL-		-ANNUAL-	
COOPERATOR	0 DAYS - $	0	0 DAYS - $	0
BLM	0 DAYS - $	0	0 DAYS - $	0

ALTERNATIVE PROGRAM BENEFIT DATA

ANNUAL OUTPUTS	BASE LEVEL	FIRST LEVEL UNITS	FIRST LEVEL YR	SECOND LEVEL UNITS	SECOND LEVEL YR	THIRD LEVEL UNITS	THIRD LEVEL YR	FOURTH LEVEL UNITS	FOURTH LEVEL YR
LIVESTOCK (AUMS)	2472	2547	12	2696	18	0	0	0	0
DEER (HUNTING DAYS)	0	0	0	0	0	0	0	0	0
ELK (HDS)	0	0	0	0	0	0	0	0	0
ANTELOPE (HDS)	0	0	0	0	0	0	0	0	0
OTH.BIG GAME (HDS)	0	0	0	0	0	0	0	0	0
WATERFOWL (HDS)	0	0	0	0	0	0	0	0	0
UPLAND&SMALL GAME	0	0	0	0	0	0	0	0	0
WARM WATER (ADS)	0	0	0	0	0	0	0	0	0
COLD WATER (ADS)	0	0	0	0	0	0	0	0	0
DEVLPD SITE (RDS)	0	0	0	0	0	0	0	0	0
DISPERSE USE (RDS)	0	0	0	0	0	0	0	0	0
NONGAME WLDF (RDS)	0	0	0	0	0	0	0	0	0
SOIL AND WATER ($)	0	0	0	0	0	0	0	0	0

0% OF LIVESTOCK AUMS ARE AVAILABLE BETWEEN 0/ 0 & 0/ 0 AT THE FINAL LEVEL

RANGELAN IVESTMENT ANALYSIS SUMMARY

DAT /04/88
TIME. 14.803

STATE: NM
DISTRICT: ALBUQUERQUE ALLOT NO: 0404 PROGRAM IDENT: RPPA
RESOURCE AREA: RIO-PUERCO ALLOT NAME: SAN-ISIDRO-WATERSHED BASE YEAR: 1984

ANNUAL YIELD, UNIT VALUES, AND PRESENT VALUES (8.625%)

OUTPUT CATEGORY	UNIT	BASE YIELD	SUSTAINED YIELD W/O	SUSTAINED YIELD WITH	UNIT VALUES	PRESENT VALUE OF CHANGE
LIVESTOCK FORAGE(AVERAGE)	AUM	2472	2472	2696	6.63	4851
LIVESTOCK FORAGE(SEASONAL)	AUM	2472	2472	2696	6.63	0
DEER HUNTING	HDS	0	0	0	50.00	0
ELK HUNTING	HDS	0	0	0	50.00	0
ANTELOPE HUNTING	HDS	0	0	0	50.00	0
OTHER BIG GAME HUNTING	HDS	0	0	0	50.00	0
WATERFOWL HUNTING	HDS	0	0	0	26.00	0
UPLAND & SMALL GAME	HDS	0	0	0	31.00	0
WARM WATER ANGLING	ADS	0	0	0	21.00	0
COLD WATER ANGLING	ADS	0	0	0	23.00	0
DEVELOPED SITE RECREATION	RDS	0	0	0	21.00	0
DISPERSED USE RECREATION	RDS	0	0	0	21.00	0
ONGAME WILDLIFE VIEWING	RDS	0	0	0	21.00	0
IL AND WATER	$'S	0	0	0	1.00	0

INVESTMENT COST SUMMARY (8.625%)

PROJECTS	--CONSTR.COST-- ACTUAL	DISCNTD	REPLCMT DISCNTD COST	-MAINTENANCE- ANN. COST	TOTAL DISCNTED	-------DISCOUNTED COST------- BLM	OTHER	TOTAL
-STRUCTURAL PROJECTS-								
SPRINGS	0	0	0	0	0	0	0	0
RESERVOIRS	0	0	0	0	0	0	0	0
WELLS	0	0	0	0	0	0	0	0
PIPELINES	0	0	0	0	0	0	0	0
FENCES	0	0	0	0	0	0	0	0
CATTLEGUARDS	0	0	0	0	0	0	0	0
GABION-DS	8094	6860	124	0	0	6984	0	6984
CHECK-DAMS	5925	5038	91	0	0	5129	0	5129
-NONSTRUCTURAL PROJECTS-								
MECH.CTRL.	0	0	0	0	0	0	0	0
CHEM.CTRL.	0	0	0	0	0	0	0	0
BURNING	0	0	0	0	0	0	0	0
SEEDING	0	0	0	0	0	0	0	0
-MANAGEMENT COSTS-								
INITIAL						0	0	0
ANNUAL						0	0	0
TOTAL	14019	11898	215	0	0	12113	0	12113

STATE: NM
DISTRICT: ALBUQUERQUE ALLOT NO: 0404 PROGRAM IDENT: RPPA
RESOURCE AREA: RIO-PUERCO ALLOT NAME: SAN-ISIDRO-WATERSHED BASE YEAR: 1984

EFFICIENCY TEST RESULTS

AUMs only

EFFICIENCY RATIOS		DISCOUNTED VALUES			
DISCOUNT RATE	BENEFIT/ ALL COST	BENEFIT/ BLM COST	PRESENT NET VALUE(B-C)	TOTAL BENEFIT	COST TOTAL	COST BLM	COST OTHERS
4.000%	1.0 / 1	1.0 / 1	673	15529	14857	14857	0
8.625%	0.4 / 1	0.4 / 1	-7262	* 4852	12113	12113	0
10.000%	0.3 / 1	0.3 / 1	-8154	3571	11725	11725	0

INTERNAL RATE OF RETURN

TOTAL COST	BLM COST	OTHER COST
4.2%	4.2%	*****%

50-YEAR UNDISCOUNTED EXPENDITURES

	BLM	OTHER	TOTAL
EXPENDITURES:	27477	0	27477
COST/ADD AUM:	3.50	0.	3.50

BLM BUDGET COSTS FOR FIRST FIVE YEARS

	NEW FACILITIES & MANAGEMENT				EXISTING FACILITIES		TOTAL
YEAR	CONST.	O. & M.	MGT.	TOTAL	O. & M.	REPLCMT.	COST
1	4581	0	0	4581	0	0	4581
2	4719	0	0	4719	0	0	4719
3	4719	0	0	4719	0	0	4719
4	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0
TOTAL	14019	0	0	14019	0	0	14019

COSTS TO OTHERS

CONSTRUCTION TOT.: 0

AVERAGE ANNUAL COST

DATA PREPARED BY

		EXISTING PROGRAM		ALTERNATIVE PROGRAM	
OPER.&MAINTENANCE:	0	XX	-RANGE CONSV.	XX	-RANGE CONSV.
ANNUALIZED REPLMT:	0	XX	-WILDLIFE BIO	XX	-WILDLIFE BIO
LIVESTOCK MANGMNT:	0	VINCENT	-MON/WATER	VINCENT	-MON/WATER
TOTAL ANNUAL COST:	0	XX	-XX	XX	-XX

550

(NOTE: ROW AND COLUMN TOTALS MAY NOT SUM CORRECTLY DUE TO ROUNDING.)

END OF DETAILED PRINTOUT

Sediment benefits only

PAGE ONE

RAN ...ND INVESTMENT ANALYSIS
****

DATE 2/04/88
TIME:14.252

STATE: NM
DISTRICT: ALBUQUERQUE
RESOURCE AREA:RIO-PUERCO

ALLOT NO: 0403
ALLOT NAME: SAN-ISIDRO-WATERSHED

PROGRAM IDENT:RPES
BASE YEAR:1984

DATA PREPARED BY:XX -RANGE CONS. XX -WILDLIFE BIOL.
VINCENT -MON/WATER XX -XX

EXISTING PROGRAM COST DATA
****

STRUCTURAL PROJECTS	UNITS		TOTAL ANNUAL MAINT. COST	
SPRINGS	0.	NO	$ 0	0%BLM
RESERVOIRS	0.	NO	$ 0	0%BLM
WELLS	0.	NO	$ 0	0%BLM
PIPELINES	0.	MI	$ 0	0%BLM
FENCES	0.	MI	$ 0	0%BLM
CATTLEGUARDS	0.	NO	$ 0	0%BLM

NONSTRUCTURAL PROJECTS		NUMBER OF UNITS BY AGE GROUP						LIFE SPAN (YRS)		TOTAL REPLACEMENT COST	%BLM
		1-5	6-10	11-15	16-20	21-25	+ 25				
[illegible]CH.CTRL.	AC	0	0	0	0	0	0	0	$	0	0
CHEM.CTRL.	AC	0	0	0	0	0	0	0	$	0	0
BURNING	AC	0	0	0	0	0	0	0	$	0	0
SEEDING	AC	0	0	0	0	0	0	0	$	0	0

EXISTING PROGRAM BENEFIT DATA
****

ANNUAL OUTPUTS	BASE LEVEL	FIRST LEVEL UNITS	FIRST LEVEL YR	SECOND LEVEL UNITS	SECOND LEVEL YR	THIRD LEVEL UNITS	THIRD LEVEL YR	FOURTH LEVEL UNITS	FOURTH LEVEL YR
LIVESTOCK (AUMS)	2472	0	0	0	0	0	0	0	0
DEER (HUNTING DAYS)	0	0	0	0	0	0	0	0	0
ELK (HDS)	0	0	0	0	0	0	0	0	0
ANTELOPE (HDS)	0	0	0	0	0	0	0	0	0
OTH.BIG GAME (HDS)	0	0	0	0	0	0	0	0	0
WATERFOWL (HDS)	0	0	0	0	0	0	0	0	0
UPLAND&SMALL GAME	0	0	0	0	0	0	0	0	0
WARM WATER (ADS)	0	0	0	0	0	0	0	0	0
COLD WATER (ADS)	0	0	0	0	0	0	0	0	0
DEVLPD SITE (RDS)	0	0	0	0	0	0	0	0	0
DISPERSE USE (RDS)	0	0	0	0	0	0	0	0	0
NONGAME WLDF (RDS)	0	0	0	0	0	0	0	0	0
SOIL AND WATER ($)	-684	0	0	0	0	0	0	0	0

0% OF LIVESTOCK AUMS ARE AVAILABLE BETWEEN 0/ 0 & 0/ 0 AT THE FINAL LEVEL

Sediment benefits only

VINCENT -MON/WATER AA XX -WILDLIFE BIOL. -XX

ALTERNATIVE PROGRAM COST DATA

PROGRAM IDENT: RPPA

STRUCTURAL PROJECTS	NEW UNITS		CONSTRUCTION COSTS BY YEAR --1--	--2--	--3--	--4--	--5--	%BLM	MAINTENANCE BEG YR	ANN COST	% BLM	REPLACEMT LIFE	COST
SPRINGS	0.	NO	0	0	0	0	0	0	0	0	0	0	0
RESERVOIRS	0.	NO	0	0	0	0	0	0	0	0	0	0	0
WELLS	0.	NO	0	0	0	0	0	0	0	0	0	0	0
PIPELINES	0.	MI	0	0	0	0	0	0	0	0	0	0	0
FENCES	0.	MI	0	0	0	0	0	0	0	0	0	0	0
CATTLEGUARDS	0.	NO	0	0	0	0	0	0	0	0	0	0	0
GABION-DS	38.0	NO	2556	2769	2769	0	0	100	0	0100	50	8094	
CHECK-DAMS	79.0	NO	2025	1950	1950	0	0	100	0	0100	50	5925	

NONSTRUCTURAL PROJECTS	NEW UNITS		CONSTRUCTION COST BY YEAR --1--	--2--	--3--	--4--	--5--	%BLM	REPLACEMENT LIFE	COST	%BLM
MECH.CTRL.	0	AC	0	0	0	0	0	0	0	0	0
CHEM.CTRL.	0	AC	0	0	0	0	0	0	0	0	0
BURNING	0	AC	0	0	0	0	0	0	0	0	0
SEEDING	0	AC	0	0	0	0	0	0	0	0	0

MANAGEMENT COSTS:	-INITIAL-		-ANNUAL-	
COOPERATOR	0 DAYS - $	0	0 DAYS - $	0
BLM	0 DAYS - $	0	0 DAYS - $	0

ALTERNATIVE PROGRAM BENEFIT DATA

ANNUAL OUTPUTS	BASE LEVEL	FIRST LEVEL UNITS	YR	SECOND LEVEL UNITS	YR	THIRD LEVEL UNITS	YR	FOURTH LEVEL UNITS	YR
LIVESTOCK (AUMS)	2472	0	0	0	0	0	0	0	0
DEER (HUNTING DAYS)	0	0	0	0	0	0	0	0	0
ELK (HDS)	0	0	0	0	0	0	0	0	0
ANTELOPE (HDS)	0	0	0	0	0	0	0	0	0
OTH.BIG GAME (HDS)	0	0	0	0	0	0	0	0	0
WATERFOWL (HDS)	0	0	0	0	0	0	0	0	0
UPLAND&SMALL GAME	0	0	0	0	0	0	0	0	0
WARM WATER (ADS)	0	0	0	0	0	0	0	0	0
COLD WATER (ADS)	0	0	0	0	0	0	0	0	0
DEVLPD SITE (RDS)	0	0	0	0	0	0	0	0	0
DISPERSE USE (RDS)	0	0	0	0	0	0	0	0	0
NONGAME WLDF (RDS)	0	0	0	0	0	0	0	0	0
SOIL AND WATER ($)	-684	-564	3	0	12	0	0	0	0

0% OF LIVESTOCK AUMS ARE AVAILABLE BETWEEN 0/ 0 & 0/ 0 AT THE FINAL LEVEL

PAGE THREE RANGELAN IVESTMENT ANALYSIS SUMMARY DATE 2/04/88
********** TIME: 14.252

STATE: NM
DISTRICT: ALBUQUERQUE ALLOT NO: 0403 PROGRAM IDENT: RPPA
RESOURCE AREA: RIO-PUERCO ALLOT NAME: SAN-ISIDRO-WATERSHED BASE YEAR: 1984

ANNUAL YIELD, UNIT VALUES, AND PRESENT VALUES (8.625%)
****

OUTPUT CATEGORY	UNIT	BASE YIELD	SUSTAINED YIELD W/O	SUSTAINED YIELD WITH	UNIT VALUES	PRESENT VALUE OF CHANGE
LIVESTOCK FORAGE(AVERAGE)	AUM	2472	2472	2472	6.63	0
LIVESTOCK FORAGE(SEASONAL)	AUM	2472	2472	2472	6.63	0
DEER HUNTING	HDS	0	0	0	50.00	0
ELK HUNTING	HDS	0	0	0	50.00	0
ANTELOPE HUNTING	HDS	0	0	0	50.00	0
OTHER BIG GAME HUNTING	HDS	0	0	0	50.00	0
WATERFOWL HUNTING	HDS	0	0	0	26.00	0
UPLAND & SMALL GAME	HDS	0	0	0	31.00	0
WARM WATER ANGLING	ADS	0	0	0	21.00	0
COLD WATER ANGLING	ADS	0	0	0	23.00	0
DEVELOPED SITE RECREATION	RDS	0	0	0	21.00	0
DISPERSED USE RECREATION	RDS	0	0	0	21.00	0
[illegible]GAME WILDLIFE VIEWING	RDS	0	0	0	21.00	0
SOIL AND WATER	$'S	-684	-684	0	1.00	4851

INVESTMENT COST SUMMARY (8.625%)
****

PROJECTS	--CONSTR.COST-- ACTUAL	DISCNTD	REPLCMT DISCNTD COST	-MAINTENANCE- ANN. COST	TOTAL DISCNTED	-------DISCOUNTED COST------- BLM	OTHER	TOTAL
-STRUCTURAL PROJECTS-								
SPRINGS	0	0	0	0	0	0	0	0
RESERVOIRS	0	0	0	0	0	0	0	0
WELLS	0	0	0	0	0	0	0	0
PIPELINES	0	0	0	0	0	0	0	0
FENCES	0	0	0	0	0	0	0	0
CATTLEGUARDS	0	0	0	0	0	0	0	0
GABION-DS	8094	6860	124	0	0	6984	0	6984
CHECK-DAMS	5925	5038	91	0	0	5129	0	5129
-NONSTRUCTURAL PROJECTS-								
MECH.CTRL.	0	0	0	0	0	0	0	0
CHEM.CTRL.	0	0	0	0	0	0	0	0
BURNING	0	0	0	0	0	0	0	0
SEEDING	0	0	0	0	0	0	0	0
-MANAGEMENT COSTS-								
INITIAL						0	0	0
ANNUAL						0	0	0
TOTAL	14019	11898	215	0	0	12113	0	12113

STATE: NM
DISTRICT: ALBUQUERQUE ALLOT NO: 0403 PROGRAM IDENT: RPPA
RESOURCE AREA: RIO-PUERCO ALLOT NAME: SAN-ISIDRO-WATERSHED BASE YEAR: 1984

Sediment Only

EFFICIENCY TEST RESULTS
****

EFFICIENCY RATIOS		DISCOUNTED VALUES			
DISCOUNT RATE	BENEFIT/ ALL COST	BENEFIT/ BLM COST	PRESENT NET VALUE(B-C)	TOTAL BENEFIT	COST TOTAL	COST BLM	COST OTHERS
4.000%	0.8 / 1	0.8 / 1	-3664	11193	14857	14857	0
8.625%	0.4 / 1	0.4 / 1	-7262	** 4852	12113	12113	0
10.000%	0.3 / 1	0.3 / 1	-7759	3966	11725	11725	0

INTERNAL RATE OF RETURN
****

TOTAL COST	BLM COST	OTHER COST
1.5%	1.5%	*****%

50-YEAR UNDISCOUNTED EXPENDITURES
****

	BLM	OTHER	TOTAL
EXPENDITURES:	27477	0	27477
COST/ADD AUM:	0.	0.	0.

BLM BUDGET COSTS FOR FIRST FIVE YEARS
****

	NEW FACILITIES & MANAGEMENT				EXISTING FACILITIES		TOTAL
YEAR	CONST.	O. & M.	MGT.	TOTAL	O. & M.	REPLCMT.	COST
1	4581	0	0	4581	0	0	4581
2	4719	0	0	4719	0	0	4719
3	4719	0	0	4719	0	0	4719
4	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0
TOTAL	14019	0	0	14019	0	0	14019

COSTS TO OTHERS	
CONSTRUCTION TOT.:	0

AVERAGE ANNUAL COST		EXISTING PROGRAM		ALTERNATIVE PROGRAM	
OPER.&MAINTENANCE:	0	XX	-RANGE CONSV.	XX	-RANGE CONSV.
ANNUALIZED REPLMT:	0	XX	-WILDLIFE BIO	XX	-WILDLIFE BIO
LIVESTOCK MANGMNT:	0	VINCENT	-MON/WATER	VINCENT	-MON/WATER
TOTAL ANNUAL COST:	0	XX	-XX	XX	-XX

DATA PREPARED BY
****

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(NOTE: ROW AND COLUMN TOTALS MAY NOT SUM CORRECTLY DUE TO ROUNDING.)

****
END OF DETAILED PRINTOUT
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